

noon and night of the 18th. The storms of the 17th in Nebraska appear to have been most severe in the Wood River Valley, where many houses were reported destroyed and a number of people were injured. On the morning of the 17th thunderstorms were forecast for the States of the lower Missouri Valley, and observers were advised that severe storms would probably occur in that section.

The storms of the afternoon and night of the 18th were especially disastrous in eastern Iowa, northern Illinois, and Wisconsin, where a number of people were killed, many injured, and property and stock were destroyed to the value of many thousands of dollars. On the morning of the 18th severe thunderstorms were forecast for eastern Iowa, northern Illinois, northern Indiana, and southern Minnesota. Shipping on Lake Michigan was warned of heavy squalls that would attend thunderstorms on the night of the 18th, and the Chicago local forecast also gave warning of severe thunderstorms that night. Exceptionally severe thunderstorms and squalls did occur in Chicago and over southern Lake Michigan in exact fulfillment of the forecasts made.

FORECASTS ON PACIFIC COAST.

During the month no wind signals were ordered and there were no storms. The most important work done by the Bureau in the Pacific northwest is through the river forecasts. More property and expense are saved by the river forecasts than by any other work done by this office. The forecasts are practically accurate. They cover the movements of the river for from two to five days. On the morning of May 20 a warning was issued to the effect that water would enter cellars on Front street, Portland, on Sunday. The merchants put many persons to work clearing out cellars, and no goods were injured by water. The river rose as was expected.

The following letter from Mr. F. C. Mathews, a rancher at Scott, Klickitat County, Wash., shows of what value the river service may be. He had written to the office of the Weather Bureau at Portland, Oreg., for information about the river, stating that his hay crop was in danger. He again writes under date of May 29, 1898:

The daily river bulletins, also your letter of the 27th inst., have been duly received. The bulletins are of inestimable value to me and, accompanied by your letter of additional explanation and suggestion, enabled me to save my hay crop and avoid unnecessary work on overflowed land. I disseminated the information received up and down the river and posted the bulletins where they would be seen by other ranchers.

AREAS OF HIGH AND LOW PRESSURES.

During the month the paths of nine areas of high and the same number of low pressure have been sufficiently well defined to be traced upon Charts I and II. It should be noted that during the warm months it is often very difficult to follow the motion of a high or low. The conditions are often extremely indefinite and are frequently characterized by a disturbed region covering quite a large area with clouds but with little clearness in the trend of the isobars. Again, there seems to be a transference of these conditions over long distances without any definite motion. The accompanying table gives the principal facts regarding the place of origin and disappearance of these highs and lows, and of their duration and velocity, and the following description is added:

Highs.—Three of the highs were first noted on the Pacific coast while all the rest came down from the north of Montana. No. VIII began off the south Pacific coast and appeared to move up the coast for two days, finally entering the country from the Washington coast. Only three of the highs reached the Atlantic, the rest disappearing in the interior or being merged in the rather permanent high pressure over the Gulf of Mexico.

Lows.—Two of the lows could be traced from the south Pacific coast to the western Gulf of Mexico. Four were first noted over the northern plateau region and the other three were first seen in the lower Missouri Valley. Six of these lows disappeared off the Atlantic coast, two in the western Gulf, and one in the Ohio Valley. These conditions were very moderate throughout the month and their mean velocity, 19 miles an hour, was considerably less than the normal velocity. The highest winds of the month along the Gulf, Lakes, and Atlantic were reported as follows:

As low No. II moved to the Atlantic, Wilmington reported 38 miles an hour from the southwest on the evening of the 6th, and on the same date Cape Henry had the same velocity from the northeast. As this same low moved very slowly up the coast it caused a northeast wind of 72 miles per hour at Block Island on the afternoon of the 8th. On the afternoon of the 19th as low No. VI moved into the St. Lawrence Valley a southwest wind of 48 miles was experienced at Cleveland, Ohio. On the afternoon of the 21st, as low No. VII moved to the upper Lake region, Chicago reported a south wind of 46 miles an hour.

Movements of centers of areas of high and low pressure.

Number.	First observed.			Last observed.			Path.		Average velocities.	
	Date.	Lat. N.	Long. W.	Date.	Lat. N.	Long. W.	Length.	Duration.	Daily.	Hourly.
High areas.										
I.....	*29, a. m.	54	113	2, a. m.	42	104	Miles. 1,030	Days. 3.0	Miles. 340	Miles. 14.2
II.....	2, a. m.	53	112	9, a. m.	29	80	3,660	7.0	521	21.7
III.....	7, a. m.	47	129	11, p. m.	28	96	3,490	4.5	553	23.0
IV.....	11, a. m.	56	114	14, a. m.	39	81	2,040	3.0	680	28.3
V.....	13, a. m.	58	110	15, p. m.	39	75	2,970	6.5	457	19.0
VI.....	19, a. m.	51	100	23, a. m.	47	92	2,550	4.0	638	26.6
VII.....	19, a. m.	43	127	25, a. m.	32	99	1,980	3.0	660	27.5
VIII.....	21, p. m.	34	123	31, p. m.	32	79	5,610	11.0	510	21.3
IX.....	23, p. m.	53	98	26, a. m.	49	83	990	2.5	396	16.5
Total.....							23,310	44.5	4,755	.....
Mean of 9 tracks.....							2,590	.....	528	22.0
Mean of 44.5 days.....									524	21.8
Low areas.										
I.....	1, a. m.	32	119	5, p. m.	26	99	1,830	4.5	407	17.0
II.....	4, p. m.	34	96	8, a. m.	39	73	1,710	3.5	489	20.4
III.....	4, p. m.	48	122	15, p. m.	48	55	4,560	11.0	415	17.3
IV.....	6, a. m.	32	116	10, p. m.	26	96	1,470	4.5	327	13.6
V.....	12, p. m.	41	117	16, p. m.	38	86	1,710	4.0	428	17.8
VI.....	14, p. m.	46	119	20, p. m.	51	65	3,340	6.0	540	22.5
VII.....	18, p. m.	38	100	26, a. m.	34	74	2,910	7.5	388	16.2
VIII.....	25, p. m.	45	101	30, a. m.	48	65	2,220	4.5	493	20.5
IX.....	26, p. m.	47	119	30, p. m.	36	73	2,850	4.0	712	29.7
Total.....							22,500	49.5	4,199	.....
Mean of 9 tracks.....							2,500	.....	467	19.4
Mean of 49.5 days.....									455	18.9

* April.

† June.

RIVERS AND FLOODS.

With the exception of a flood in the Arkansas during the first half of the month, the rivers had a tendency to lower stages, which indicates the approach of the usual summer conditions.

General and heavy precipitation during the first few days of the month, in the valleys drained by the Arkansas River and its tributaries, caused a rapid and unusual rise in that stream. The danger line at Little Rock was passed on the 6th and was exceeded on ten consecutive days thereafter.

During this flood the high water record at Fort Smith and Dardanelle, Ark., was broken. At Fort Smith, the highest of record, heretofore, was 30.9 feet, which occurred May 19, 1892, and at Dardanelle the highest of record was 27.9 feet, which occurred May 18, 1892. During the flood of the present year the water at Fort Smith and Dardanelle registered 35.4 and 29.3 feet, respectively.

The highest and lowest water, mean stage, and monthly range at 118 river stations are given in the accompanying table. Hydrographs for typical points on seven principal rivers are shown on Chart No. VII. The stations selected for charting are: Keokuk, St. Louis, Cairo, Memphis, and Vicksburg, on the Mississippi; Cincinnati, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.

For fuller details see Monthly Bulletin of the River and Flood Service for May, 1898.

Heights of rivers referred to zeros of gauges, May, 1898.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Mississippi River.	<i>Miles</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>
St. Paul, Minn.	1,957	14	5.0	30, 31	2.9	13, 14	3.7	2.1
Reeds Landing, Minn.	1,887	12	4.5	31	2.7	18	3.2	1.8
La Crosse, Wis.	1,822	10	4.7	1, 2, 31	3.8	20, 21	4.2	0.9
North McGregor, Iowa.	1,762	18	5.8	1	3.8	22, 25	4.4	2.0
Dubuque, Iowa.	1,702	15	5.8	1, 2	3.7	24, 25	4.4	2.1
LeClaire, Iowa.	1,612	10	4.0	3	2.6	27	3.2	1.4
Davenport, Iowa.	1,596	15	5.0	3	3.4	27	4.0	1.6
Galland, Iowa.	1,475	8	3.3	20, 21	2.2	29, 30	2.6	1.1
Keokuk, Iowa.	1,466	14	6.6	20	3.5	14, 29, 30	4.4	3.1
Hannibal, Mo.	1,405	17	11.7	21	4.8	31	6.6	6.9
Grafton, Ill.	1,307	23	18.1	23	9.2	13, 14	12.3	8.9
St. Louis, Mo.	1,264	30	27.2	23	14.8	2	20.8	12.4
Chester, Ill.	1,189	30	22.2	24	11.4	2	16.4	10.3
Cairo, Ill.	1,073	40	35.3	26	27.2	18	30.7	8.1
Memphis, Tenn.	843	33	26.3	28, 29	19.9	20	22.6	6.4
Helena, Ark.	767	44	36.4	30	30.3	21	33.0	6.1
Arkansas City, Ark.	625	42	45.4	1	39.5	8, 9	38.9	5.9
Greenville, Miss.	595	40	40.3	1	33.9	9	36.3	6.4
Vicksburg, Miss.	474	41	47.8	1	41.9	13-15, 28-30	43.2	5.9
New Orleans, La.	108	16	17.0	1	14.8	22, 25, 27, 30, 31	15.5	2.2
Arkansas River.								
Wichita, Kans.	720	10	5.3	2, 3	2.1	18, 25	2.9	3.2
Fort Smith, Ark.	345	22	35.0	7	5.4	1	18.0	29.6
Dardanelle, Ark.	250	21	29.3	10	6.5	1	17.6	22.8
Little Rock, Ark.	170	23	27.2	11	9.5	1	19.9	17.7
White River.								
Newport, Ark.	150	26	32.1	8	14.3	1	22.6	17.8
Des Moines River.								
Des Moines, Iowa.	150	19	4.6	26, 29	3.9	10, 11, 16-21	4.1	0.7
Illinois River.								
Peoria, Ill.	135	14	14.2	26	8.8	15	11.1	5.4
Missouri River.								
Bismarck, N. Dak.	1,201	14	9.3	31	3.8	17, 18	5.8	5.5
Pierre, S. Dak.	1,066	14	8.3	30	4.2	19	5.5	4.1
Sioux City, Iowa.	676	19	12.9	30	8.0	11	9.4	4.9
Omaha, Nebr.	561	18	12.1	31	8.2	12, 13	9.2	3.9
St. Joseph, Mo.	373	10	7.3	31	3.4	15	4.7	3.9
Kansas City, Mo.	280	21	16.7	31	10.4	13	13.1	6.3
Boonville, Mo.	191	20	16.9	21	9.8	1	13.5	7.1
Hermann, Mo.	95	24	18.0	22	9.6	1	14.7	8.4
Ohio River.								
Pittsburg, Pa.	966	22	13.5	18	3.2	7	6.6	10.3
Davis Island Dam, Pa.	960	25	13.3	18	5.6	6, 7	8.2	7.7
Wheeling, W. Va.	875	36	16.9	19	6.5	7	10.1	10.4
Parkersburg, W. Va.	785	35	18.9	19	8.4	6	12.0	10.5
Point Pleasant, W. Va.	703	36	21.8	20	7.9	6	14.8	13.9
Catlettsburg, Ky.	651	50	25.7	20	11.2	6	19.0	14.5
Portsmouth, Ohio.	612	50	26.5	21	12.8	6	20.5	13.7
Cincinnati, Ohio.	499	45	28.5	1	16.9	6	23.7	11.6
Louisville, Ky.	367	24	10.6	22	8.6	6	9.7	2.0
Evansville, Ind.	184	30	23.1	25	16.3	20	20.1	8.8
Paducah, Ky.	47	40	23.1	26	16.7	19, 20	20.1	6.4
Allegheny River.								
Warren, Pa.	177	7	4.0	21, 23	1.8	17-19	2.5	2.2
Oil City, Pa.	123	13	5.5	21	2.2	11	3.2	3.3
Parkers Landing, Pa.	73	20	6.2	21	2.0	11	3.3	4.2
Freeport, Pa.	26	20	10.5	21	4.1	6, 7	6.4	6.4
Conemaugh River.								
Johnstown, Pa.	64	7	4.6	16	1.8	3-5	2.6	2.8
Red Bank Creek.								
Brookville, Pa.	35	8	1.7	27, 28	1.0	1-18	1.2	0.7
Beaver River.								
Ellwood Junction, Pa.	10	14	2.8	21	0.6	31	1.4	2.2
Cumberland River.								
Burnside, Ky.	434	50	9.5	9	3.5	31	5.8	6.0
Carthage, Tenn.	257	30	8.2	1	3.8	31	6.0	4.4
Nashville, Tenn.	175	40	13.1	1	6.2	20, 21	8.8	6.9
Great Kanawha River.								
Charleston, W. Va.	61	30	14.8	8	4.1	5, 6	6.7	10.7
New River.								
Hinton, W. Va.	95	14	7.0	7	1.8	4, 5	3.0	5.2
Licking River.								
Falmouth, Ky.	30	25	11.1	7	1.6	31	3.6	9.5
Miami River.								
Dayton, Ohio.	69	18	5.2	16	1.8	31	2.8	3.4

Heights of rivers above zeros of gauges—Continued.

Stations.	Distance to mouth of river.	Danger line on gauge.	Highest water.		Lowest water.		Mean stage.	Monthly range.
			Height.	Date.	Height.	Date.		
Monongahela River.	<i>Miles</i>	<i>Feet.</i>	<i>Feet.</i>		<i>Feet.</i>		<i>Feet.</i>	<i>Feet.</i>
Weston, W. Va.	161	18	3.0	16	-0.6	3-7	0.3	3.6
Fairmont, W. Va.	119	25	15.1	17	0.8	30, 31	3.1	14.3
Greensboro, Pa.	81	18	18.7	17	7.6	31	9.1	11.1
Lock No. 4, Pa.	40	23	19.0	18	7.1	6	9.7	11.9
Cheat River.								
Rowlesburg, W. Va.	36	14	9.0	17	1.9	5	4.0	7.1
Youghiogheny River.								
Confluence, Pa.	59	10	4.7	23	1.1	6	2.3	3.6
West Newton, Pa.	15	25	6.5	17	1.1	7	2.5	5.4
Muskingum River.								
Zanesville, Ohio.	70	20	17.7	17	8.2	6	11.5	9.5
Tennessee River.								
Knoxville, Tenn.	614	29						
Kingston, Tenn.	534	25	3.8	27	1.4	24, 25	1.9	2.4
Chattanooga, Tenn.	430	33	6.5	1	3.4	24, 25	4.3	3.1
Bridgeport, Ala.	330	34	5.0	1	1.8	24, 25	7.7	3.2
Florence, Ala.	230	16	5.5	2	1.6	27, 28	2.9	3.9
Johnsonville, Tenn.	94	21	9.0	1	3.0	29, 30	5.1	6.0
Clinch River.								
Spears Ferry, Va.	156	30	6.6	24	0.3	2, 3, 5, 6	1.1	6.3
Clinton, Tenn.	46	25	12.0	26	3.8	6, 7	5.6	8.2
Wabash River.								
Mount Carmel, Ill.	50	15	15.8	30	5.4	20	9.5	10.4
Red River.								
Arthur City, Tex.	688	27	21.1	8	4.0	3	10.3	17.1
Fulton, Ark.	565	28	27.9	11	7.2	3	18.9	30.7
Shreveport, La.	449	29	14.9	21	5.7	5	11.9	9.2
Alexandria, La.	139	33	15.0	26, 27	7.7	2	12.0	7.3
Atchafalaya Bayou.								
Melville, La.	100*	31	33.9	1-4	32.1	29-31	32.9	1.8
Ouachita River.								
Camden, Ark.	340	39	28.9	10	6.8	21	16.5	22.1
Monroe, La.	100	40	30.8	21, 22	18.8	6	19.9	2.0
Yazoo River.								
Yazoo City, Miss.	80	25	24.0	1	16.9	29-31	19.9	7.1
Chattahoochee River.								
Columbus, Ga.	140	20	2.5	1	-0.9	25, 26	0.5	3.4
Flint River.								
Albany, Ga.	80	20	4.3	1	1.0	20, 22	1.7	3.3
Cape Fear River.								
Fayetteville, N. C.	100	38	12.0	25	2.9	24	5.3	9.1
Columbia River.								
Umatilla, Ore.	270	25	20.8	31	12.1	3	15.8	8.1
The Dalles, Ore.	166	40	34.4	31	20.8	4	25.7	13.6
Willamette River.								
Albany, Ore.	99	20	4.0	1, 2	2.8	10, 11, 26, 28	3.2	1.2
Portland, Ore.	10	15	18.1	31	11.3	2-4	13.7	6.8
Edisto River.								
Edisto, S. C.	75	6	4.7	3	1.3	24	2.6	3.4
James River.								
Lynchburg, Va.	257	18	7.6	8	0.9	5	2.6	6.7
Richmond, Va.	110	12	10.2	9	0.2	4, 5	2.0	10.0
Alabama River.								
Montgomery, Ala.	265	35	5.4	1	0.1	28, 29	1.7	5.3
Selma, Ala.	212	35	8.9	1	-0.3	29-31	1.9	9.2
Cosa River.								
Rome, Ga.	225	30	2.8	1	1.4	20-31	1.8	1.4
Gadsden, Ala.	144	18	3.6	1	0.4	25, 30, 31	1.3	3.2
Tombigbee River.								
Columbus, Miss.	285	33	2.2	6	-2.3	22	-0.4	4.5
Demopolis, Ala.	155	35	16.5	1	0.0	26	4.5	16.5
Black Warrior River.								
Tuscaloosa, Ala.	90	38	11.3	1	0.3	31	3.3	11.0
Pedee River.								
Cheraw, S. C.	145	27	14.2	25	1.2	22, 23	2.6	13.0
Black River.								
Kingstree, S. C.	60	12	8.2	8	1.8	31	4.8	6.4
Lumber River.								
Fairbluff, N. C.	10	6	4.7	5, 6	0.5	30, 31	2.4	4.2
Lynch Creek.								
Effingham, S. C.	35	12	9.8	2	2.4	28	4.9	7.4
Potomac River.								
Harpers Ferry, W. Va.	170	16	11.0	9	2.5	5, 6	4.2	8.5
Roanoke River.								
Clarksville, Va.	155	12	8.5	24	0.5	5	2.6	8.0
Sacramento River.								
Red Bluff, Cal.	241	23	3.2	22	0.2	8-13	1.1	3.0
Sacramento, Cal.	70	25	13.6	1	11.4	16-22	12.0	2.2
Santee River.								
St. Stephens, S. C.	50	12	7.4	2, 3	-0.3	27	2.7	7.7
Congaree River.								
Columbia, S. C.	27	15	2.1	1	1.1	15, 22	1.3	1.0
Wateree River.								
Camden, S. C.	45	24	4.8	1	2.1	25	3.3	2.3

THE WEATHER OF THE MONTH.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

The statistical aspects of the weather of the month are presented in the tables which form the closing part of this REVIEW. Table I in particular contains a variety of details from which the reader may select those most interesting to himself. The numerical values in the tables have been generalized in a number of cases, the results appearing on Charts Nos. III to VIII, inclusive.

PRESSURE AND WIND.

Normal conditions.—The geographic distribution of normal barometric readings at sea level and under local gravity for May is shown by Chart VI of the MONTHLY WEATHER REVIEW for May, 1893.

In May as compared with April there is usually a decrease of pressure over the United States and Canada, amounting on the average to 0.05 inch. Pressure is lowest (29.80) over Arizona and contiguous portions of the Southwest, and highest (30.00) on the Pacific and Atlantic coasts.

In May the general tendency of the winds, with few exceptions, is to blow toward the center of the continent. Southeasterly winds prevail over Texas and northward for some distance on the plains. Southwesterly winds prevail in the lower Lake Region and New England.

The current month.—The configuration of the isobars on the chart of mean pressure for the current month presents no features of special interest. Pressure was below normal in all sections save eastern Maine, New Brunswick, and Nova Scotia, the northeastern slope of the Rocky Mountains, the upper Missouri Valley, Manitoba, Assiniboia, and the southern portion of Alberta.

TEMPERATURE OF THE AIR.

Normal conditions.—The normal mean temperature of the air in the United States in May varies from about 79° at Key West, 75° at Jacksonville, 75° at New Orleans, 76° at Galveston, 60° at San Diego, to 48° at Eastport, 55° at Burlington, 54° at Buffalo, 58° at Detroit, 48° at Duluth, 52° at St. Vincent, 53° at Havre, 57° at Spokane, and 55° at Seattle, on Puget Sound. The warmest regions now are the lower Rio Grande Valley and southwestern Arizona, including a portion of the desert region of California. The seacoast is cooler than the interior on corresponding parallels. The coldest portion of the United States is the region about Lake Superior.

In studying the distribution of monthly mean temperatures it will be found very helpful to consult the charts at the end of this REVIEW, especially No. VI, Surface Temperatures, Maximum, Minimum, and Mean. This chart gives a very good idea of the variations of temperature with latitude and longitude, and also of the distribution of normal surface temperatures. Chart VI for any month will differ from a normal chart merely in the displacement or bending of the isotherms northward or southward according as the temperature of the particular locality is above or below the normal for the place and season.

The current month.—It will be recalled that April, 1898, was considerably cooler than usual. The region of relatively high temperature for that month, included Nevada, western Utah, southern Idaho, and Arizona; the regions of abnormally low temperature included the lower Mississippi Valley, Alabama, northwestern Georgia, and some portions of North Carolina, Virginia, West Virginia, Kentucky, and Tennessee. For the current month temperature was below normal in New

England, eastern New York, Pennsylvania, New Jersey, and Delaware. Elsewhere east of the one-hundredth meridian the temperature was normal, or slightly above, the greatest excess being in eastern Tennessee, northern Georgia, and the western portions of North Carolina and South Carolina. The average daily temperature was in excess by about 3° over that area. The weather was cloudy and wet throughout the Rocky Mountain and Plateau regions, and the temperature was below normal, except in the extreme northwestern corner of Washington. Deficits of 3° and over in daily means were recorded in southern Wyoming, northwestern Colorado, and a portion of northeastern Utah.

The lowest temperature registered at any station was 8° above zero at Lake Moraine and Longs Peak, Colo., in the mountain region of that State. Temperatures below freezing were recorded generally throughout the elevated portions of West Virginia, Pennsylvania, also in western New York, throughout northern Michigan, the Lake Superior region, northern Wisconsin, North Dakota, and portions of South Dakota, and quite generally throughout the Rocky Mountain and Plateau regions.

The maximum temperature of the month was recorded in the Valley of the Colorado River in Arizona. Temperatures of 105° and over were also recorded in the lower Rio Grande Valley. There was also a small area in Georgia and South Carolina over which temperatures exceeding 100° were recorded. In the mountain regions of Colorado and Utah maximum temperatures varied from 80° to 85°.

The distribution of the observed monthly mean temperature of the air is shown by red lines (isotherms) on Chart VI. This chart also shows the maximum and the minimum temperatures, the former by broken and the latter by dotted lines. As will be noticed, these lines have been drawn over the Rocky Mountain Plateau region, although the temperatures have not been reduced to sea level; the isotherms relate, therefore, to the average surface of the country in the neighborhood of the various observers, and as such must differ greatly from the sea-level isotherms of Chart IV.

The average temperatures of the respective geographic districts, the departures from the normal of the current month and from the general mean since the first of the year, are presented in the table below for convenience of reference:

Average temperatures and departures from the normal.

Districts.	Number of stations.	Average temperatures for the current month.	Departures for the current month.	Accumulated departures since January 1.	Average departures since January 1.
New England	10	52.8	- 1.1	+ 8.3	+ 1.7
Middle Atlantic	12	61.0	- 0.5	+ 8.5	+ 1.7
South Atlantic	10	72.2	+ 1.9	+ 5.5	+ 1.1
Florida Peninsula	3	76.7	+ 0.9	+ 0.8	+ 0.2
East Gulf	4	74.7	+ 1.8	+ 3.4	+ 0.7
West Gulf	4	74.4	+ 1.8	+ 9.8	+ 2.0
Ohio Valley and Tennessee	12	67.0	+ 2.0	+ 9.5	+ 1.9
Lower Lake	8	57.8	+ 1.1	+ 15.9	+ 3.2
Upper Lake	9	53.2	+ 1.6	+ 18.9	+ 3.8
North Dakota	11	53.2	+ 0.1	+ 25.1	+ 5.0
Upper Mississippi	11	62.2	+ 0.8	+ 15.2	+ 3.0
Missouri Valley	10	61.0	+ 0.4	+ 17.6	+ 3.5
Northern Slope	7	51.6	- 1.7	+ 8.0	+ 1.6
Middle Slope	6	61.1	- 0.9	+ 8.0	+ 1.6
Southern Slope	5	68.7	- 0.1	+ 9.0	+ 1.8
Southern Plateau	13	64.4	- 2.7	- 0.5	- 0.1
Middle Plateau	9	52.6	- 3.5	- 8.4	- 1.7
Northern Plateau	11	54.2	- 1.8	+ 4.5	+ 0.9
North Pacific	9	54.1	+ 0.4	+ 3.9	+ 0.8
Middle Pacific	5	55.1	- 3.3	- 5.4	- 1.1
South Pacific	4	60.2	- 2.2	- 1.1	- 0.2

In Canada.—Prof. R. F. Stupart says:

In southern Alberta, western Assiniboia, and the greater portion of Saskatchewan, the mean temperature was average or slightly below, but in all other portions of Canada it was above the average, except along the Nova Scotian coast, where the average was just maintained. The excess of average was particularly marked in northern Ontario and over the greater portion of Quebec and New Brunswick. Parry Sound recorded 5° above the average, Rockliffe and Quebec 4° above, Sault Ste. Marie, Toronto, Chatham, and New Brunswick 3° above the average.

PRECIPITATION.

Normal conditions.—Heavy precipitation in May occurs chiefly in northeastern Texas, Arkansas, the lower Mississippi Valley, Tennessee, and portions of Georgia, and generally throughout the Atlantic seaboard as far north as the southern coast of New England. Heavy precipitation also occurs in May on a narrow strip of the coast of Washington and Oregon. The regions of moderate precipitation (2 to 4 inches) are somewhat larger in extent than for the preceding month. The plains region, from about the one hundred and third meridian eastward, has now a normal rainfall of 2 inches. There is also a considerable area in western Montana, extending westward through Idaho and southward through a portion of Wyoming which has an average rainfall of over 2 inches. The regions of scant precipitation include, as before, the greater part of New Mexico, southwestern Colorado, southern Utah, Arizona, Nevada, and southern California.

The current month.—May, 1898, must be classed as a month of more than the usual amount of rainfall, the rainfall of western Kansas, in particular, being very heavy. Throughout the entire plains region and the Mississippi Valley north of Memphis more than the usual amount of rain fell, and this is true of the Plateau region and the Pacific coast, save a narrow strip of western Washington and Oregon and northwestern California. More than the usual amount of rain fell on the Atlantic coast from Massachusetts southward to North Carolina. It is worthy of note that, following a protracted dry spell in California and the Plateau region, heavy rains fell throughout a large part of that region, although the rainy season was almost at an end.

The distribution of precipitation was somewhat irregular, as may be seen by an examination of Chart III. In the great wheat and corn regions of the interior the amount averaged from 2 to 4 inches; in some portions of Missouri, Kansas, and Nebraska from 4 to 6 inches.

Average precipitation and departures from the normal.

Districts.	Number of stations.	Average.		Departure.	
		Current month.	Percentage of normal.	Current month.	Accumulated since Jan. 1.
		Inches.		Inches.	Inches.
New England	10	4.91	136	+1.30	+3.60
Middle Atlantic	12	5.04	138	+1.40	+1.50
South Atlantic	10	2.34	58	-1.70	-8.50
Florida Peninsula	1	1.61	39	-2.50	-8.50
East Gulf	1	0.67	16	-3.40	-10.90
West Gulf	1	3.42	77	-1.00	-3.00
Ohio Valley and Tennessee	12	3.38	87	-0.50	+0.30
Lower Lake	8	2.62	77	-0.80	+0.30
Upper Lake	9	2.59	76	-0.80	-0.10
North Dakota	7	2.64	113	+0.30	-0.40
Upper Mississippi	11	5.25	127	+1.10	+4.40
Missouri Valley	10	5.52	128	+1.30	+2.00
Northern Slope	7	3.67	155	+1.30	+0.70
Middle Slope	6	6.62	183	+3.00	+3.50
Southern Slope	6	3.99	82	-0.90	-0.30
Southern Plateau	13	0.95	173	+0.40	-0.70
Middle Plateau	9	2.44	235	+1.40	-1.90
Northern Plateau	11	2.03	133	+0.50	-1.10
North Pacific	9	1.87	70	-0.80	-1.10
Middle Pacific	5	2.13	131	+0.50	-8.00
South Pacific	4	1.06	294	-0.70	-5.00

The rainfall at Dodge City, Kans., was over 10 inches, an amount greater than the combined rainfall of the same month during the last six years. Attention is called to the fact that the rainfall of 1897 in western Kansas and adjoining regions was plentiful. The rainfall for the current month in this region is likewise greatly in excess of the normal, thus exemplifying the principle that years of abundant rainfall are quite likely to follow each other in succession.

There was a general deficiency in rainfall in the Gulf and South Atlantic States. The drought in Florida continued throughout the month, save at Key West, where the rainfall was about normal. Deficiencies of about 3 inches were recorded in Alabama, lower Mississippi, and Louisiana. There was also a slight deficiency of rainfall in the lower Lake region, including a part of northern Indiana. The rainfall of the eastern Gulf States was less than 20 per cent of the normal, something almost unprecedented for that region.

In Canada.—Professor Stupart says:

During the month of May the rainfall was above the average over the more northern portions of Ontario and Quebec, and also locally in the western portion of Alberta, but the excess was nowhere very marked. In all the remaining parts of Canada it was below the average, except at one or two isolated spots, where the excess above the average was due apparently to local thunderstorms. The deficiency was decidedly pronounced over the greater portion of the Territories and Manitoba, the rainfall in some places being almost *nil*. Edmonton was 1.3 inch below the average, and Winnipeg 1.5 inch below. Throughout the Maritime Provinces, also, the rainfall was very considerably below the usual amount. Halifax was 2.0 inches, Sydney 2.5 inches, and St. John 2.4 inches below the average.

SNOWFALL.

The total snowfall for the current month is given in Tables I and II, and its geographic distribution is shown on Chart VIII. The snowfall of the month was confined principally to the Rocky Mountain region. The snowfall of the Sierra Nevada was very much less than in former years. There was also a rather unusual snowfall in southern Indiana, southwestern Ohio, and northern Kentucky. Snow fell in this region on the 6th heavy enough to break the growing wheat at the joints. It melted soon after falling. This is a case of heavy local snows in the middle of a region of higher temperature, with surface temperatures above the freezing point in all cases.

The snow on the ground at end of month.—There was no snow on the ground at the end of the month at reporting stations.

HAIL.

The following are the dates on which hail fell in the respective States:

Alabama, 14, 30. Arizona, 2, 3, 4. Arkansas, 1, 2, 4, 12, 13, 20, 21. California, 12, 28, 30, 31. Colorado, 1, 2, 3, 4, 6, 7, 13, 14, 15, 16, 17, 18, 19, 20, 23, 24, 25, 28, 30, 31. Connecticut, 7, 8. Delaware, 16. Florida, 18, 25. Georgia, 11, 14, 15, 18, 22, 30. Idaho, 2, 3, 4, 6, 7, 12, 17, 18, 19, 20, 23, 24, 28, 29, 30, 31. Illinois, 18, 19, 27, 29. Indiana, 5, 10, 11, 15, 18, 19, 21. Indian Territory, 1, 2, 4, 27. Iowa, 4, 6, 9, 10, 14, 17, 18, 19, 20, 21, 24, 26, 29, 31. Kansas, 5, 6, 11, 15, 20, 22, 28, 29, 30. Louisiana, 27. Maryland, 8, 10, 11, 12, 16, 24. Michigan, 2, 4, 9, 10, 18, 19, 21. Minnesota, 18, 25, 26, 31. Mississippi, 2, 24, 30. Missouri, 1, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 27, 28, 29, 31. Montana, 3, 12, 15, 16, 17, 18, 24, 30. Nebraska, 1, 14, 17, 19, 20, 21, 23, 25, 26, 27, 28, 31. Nevada, 2, 3, 4, 6, 7, 13, 14, 16, 17, 18, 19, 22, 24, 27, 29. New Hampshire, 14, 17. New Jersey, 8, 13, 16, 24. New Mexico, 7, 8, 12, 23, 31. New York, 4, 8, 11, 19. North Carolina, 5, 6, 11, 12, 15, 18, 22, 25, 26, 28, 29, 30. Ohio, 2, 5, 6, 11, 15, 16, 18, 19, 21, 28. Oklahoma, 1, 4, 15, 31. Oregon, 21, 22, 28, 29, 30, 31. Pennsylvania, 8, 10, 11, 19, 24. South Carolina, 6, 11, 15, 18, 19, 23, 25. South Dakota, 11, 17, 20, 24, 25. Tennessee, 5, 6, 12, 14, 15, 16, 22, 25, 28, 29, 30. Texas, 1, 2, 3, 4, 5, 18, 19, 20, 24, 27, 29, 30, 31. Utah, 1, 2, 3, 7, 16, 18, 19, 20.

Vermont, 13. Virginia, 5, 6, 8, 12, 15, 16, 17, 19, 21, 22, 24, 27, 28, 30. Washington, 17, 26, 28, 29, 30. West Virginia, 6, 7, 12, 15, 19, 21, 22, 23, 29. Wisconsin, 18, 21, 26. Wyoming, 11, 12, 13, 14, 15, 23, 24, 30.

SLEET.

The following are the dates on which sleet fell in the respective States:

California, 1, 6, 19. Connecticut, 8. Illinois, 5. Massachusetts, 8. Michigan, 5. Nevada, 1, 2, 3, 7, 15, 16, 17, 18, 23, 27. New York, 6. Rhode Island, 8. South Dakota, 11.

HUMIDITY.

The humidity observations of the Weather Bureau are divided into two series; the first or tridaily series began in 1871 and ended with 1887; the second or twice-daily series is continuous from 1888 to the present time.

The monthly means of the second or present series are based upon observations of the whirled psychrometer at 8 a. m. and 8 p. m., seventy-fifth meridian time, which corresponds to 5 a. m. and 5 p. m., Pacific; 6 a. m. and 6 p. m., Mountain; and 7 a. m. and 7 p. m., Central standard time.

Mean values computed from the first series are naturally not directly comparable with those of the second. In general the means of the first series are lower than those of the second, since they include an observation in the afternoon when the relative humidity of the air is near the minimum of the day. At stations in the western plateau region, however, the converse holds good, the means of the second series being lower than those of the first by amounts ranging from 0 to 10 per cent on the average of the year.

In the present state of knowledge respecting the diurnal variation in the moisture of the air, we are scarcely warranted in combining the two series in a general mean.

The current month.—The variations in relative humidity during the current month are greater than have been noticed since the beginning of the year. The relative humidity of the Plateau region was unusually high, as was also the case over the middle slope, the northern slope, and the Missouri Valley. The regions of low relative humidity were the Florida Peninsula, the east Gulf, and the north Pacific coast. There was, as might be expected, a fair agreement between the three elements, humidity, cloudiness, and rainfall.

Average relative humidity and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	80	+12	Missouri Valley	70	+5
Middle Atlantic	77	+8	Northern Slope	62	+5
South Atlantic	73	-1	Middle Slope	68	+8
Florida Peninsula	72	-5	Southern Slope	58	0
East Gulf	67	-5	Southern Plateau	59	-1
West Gulf	75	+12	Middle Plateau	56	+11
Ohio Valley and Tennessee	67	-1	Northern Plateau	56	-2
Lower Lake	72	+12	North Pacific Coast	72	-6
Upper Lake	74	+12	Middle Pacific Coast	72	-6
North Dakota	61	-3	South Pacific Coast	68	0
Upper Mississippi Valley	73	+5			

In using the table by means of which the amount of moisture in the air is computed from the readings of the wet and dry bulb thermometers, the pressure argument has almost always been neglected, an omission that has little significance except for low temperatures and at high stations, such as Santa Fe, El Paso, Cheyenne, and a few others. The failure to apply a correction for the influence of the prevailing pressure on the psychrometer has the effect of making the monthly means of relative humidity at high-level stations too small by quantities ranging from 5 to 10 per cent. In the application of the monthly averages of the above table, or those of individual stations in Table I, to special inquiries, whether in the

departments of biology, climatology, or sanitary science, this fact should be kept in mind. It should also be remembered that the hours at which observations in the Rocky Mountain Plateau region are made, viz, at 5 or 6 local mean time, morning and afternoon, give approximately the maximum and minimum values for the day; probably the means of such hours approach more nearly the true mean of the month than is the case on the Atlantic seaboard and in the seventy-fifth meridian time belt.

WIND.

High winds, local storms, and tornadoes.—The current month will pass into history as one memorable on account of the number and violence of tornadoes that devastated portions of Iowa, Illinois, and Wisconsin. A period of unusual violence began on the 17th, continuing on the 18th, 19th, and 20th. Charts IX and X show the weather conditions that prevailed at 8 p. m., seventy-fifth meridian time, May 17 and 18, respectively. Dotted lines show the approximate position of tornadoes that occurred on those dates. It is to be noted that tornadic activity began about 6 p. m. of the 17th almost coincidentally at three widely separated places, viz, in the vicinity of Waynoka, Okla.; in Kingman County, Kans.; and near Riverton, Nebr. These points, it will be observed, are almost identical in longitude. The tornadoes of the 17th were not unusually violent, nor did they persist for a great length of time. The origin was gradually transferred eastward, the last occurrence being noted in Iowa and Missouri shortly after 7 o'clock. Although 13 persons were injured and nearly \$50,000 worth of property was destroyed, no lives were lost on this date.

On the following date tornadoes developed almost simultaneously in Cedar County, Iowa, and Eau Claire County, Wis. Both tornadoes were of the most violent character. The Iowa tornado can be traced well into Carroll County, Ill., a distance of over 50 miles. The Wisconsin tornado can not be tracked the entire distance between the beginning of tornadic activity and the place where destructive violence was last manifested, but there can be no question of the severity of the storm over the last 30 or 35 miles of its course. Farther to the eastward a number of tornadoes developed later in the day at points a little to the southeast of the main track, moving in all cases parallel to the course of the two first named. The fatalities of the day numbered 47. Property valued at more than half a million dollars was totally destroyed, and this does not include the loss to standing timber, orchards, and crops. The tornadoes in all cases moved a little north of east. The rate of movement was generally from 30 to 40 miles per hour.

Tornadic activity was renewed on the 19th in southern Oklahoma, but no serious damage was done. On the following day tornadoes were observed in northern Texas, Kansas, northwestern Arkansas, Missouri, and southwestern Illinois, but they were not especially destructive in any case. The record in detail follows:

May 1.—Jerico, Cedar Co., Mo., 11:15 a. m., central time. One killed, 5 injured; path 50 to 100 feet wide; length probably less than 10 miles; property loss about \$3,000; moved northeast.

Mobeetie, Tex., 1:45 a. m., central time. Six killed, 37 injured; path a quarter of a mile wide; probably 30 miles long. Twenty-three buildings destroyed; moved northeast.

Ten miles southeast of Chetopa, Ind. T., 11 a. m., central time. Three persons injured; path narrow; about 15 miles long; property loss about \$1,000; moved east-northeast.

A severe local storm passed over Sapulpa, Ind. T., about 9 a. m., central time. Six buildings were damaged to the extent of \$1,000.

2d.—A severe rain and hail storm passed through Ellis Co., Tex., from northwest to southeast, destroying two buildings in the vicinity of Waxahachie and damaging six others.

3d.—Severe wind and hail storms were reported from the eastern portion of Indian Territory, being most severe at Sallisaw.

5th.—A miniature tornado struck Elkin, N. C., about 4 p. m., eastern time. Three persons were injured; path of great destruction half a mile long; property loss about \$1,000; moved to the southeast.

11th.—Four or five persons were injured and several buildings were destroyed by a severe windstorm 8 miles north of Shawnee, Ind. T. Particulars can not be had. Property loss by windstorm of \$1,000 is reported at Sapulpa, Ind. T.

17th.—6:30 p. m., central time. Had its origin about 3 miles southwest of the village of Waynoka, Okla., latitude, $36^{\circ} 30'$ north; longitude, $98^{\circ} 55'$ west, approximately; moved northeasterly, passing through the village and open country beyond, and was last seen near Alva, about 20 miles from its origin; no lives lost; property loss small, about \$600.

6 p. m., central time. Had its origin in Gove Township, southeastern corner of Pratt County, Kans.; latitude, $37^{\circ} 30'$ north; longitude, $98^{\circ} 30'$ west, approximately; moved northeasterly through the open country, destroying a few farm houses. Struck the southern half of the town of Cunningham, Kans., totally destroying about 20 buildings and partially wrecking a number of others; no lives lost; property loss probably \$50,000. An iron safe weighing 1,700 pounds was carried 53 yards north-northeast passing over the cellar of a wrecked hotel.

5 p. m., central time. Supposed to have originated on the northern border of Kansas, 12 miles southwest of Riverton, Nebr., near which place it passed at 5:30 p. m., moving in a northeasterly course. Several persons were injured in Franklin County. The property loss in the county was estimated at \$10,000; the loss near Bladen, in Webster County, 20 miles northeast of Riverton, was estimated at \$3,000. A second tornado is believed to have formed to the northeast of Riverton probably as early as 5 p. m., since the tornado that caused the destruction near Braden passed the latter place at 5:20 p. m., central time.

A third tornado passed over the eastern edge of Kearney County, Nebr., crossing into Hall County near the little town of Wood River. Two persons were injured, and the property loss is said to have been \$20,000. Severe windstorms prevailed generally throughout central and eastern Nebraska on the afternoon of the 17th. Some destruction of property was reported from Albion and several persons were injured by falling walls.

Tornadic action was also reported about 8 miles northwest of Neligh, Antelope Co., Nebr.

A minor tornado passed through a portion of Buchanan County, Mo., about 10 p. m., central time. The destruction was confined principally to orchards, outbuildings, and timber. No persons were injured. Approximate position of tornado: Latitude, $39^{\circ} 35'$; longitude, $94^{\circ} 45'$.

A tornado formed in the southeastern part of Taylor County, Iowa, about 5 p. m., central time, and disappeared in the adjoining county of Ringgold. Seven persons were injured; property loss estimated at \$5,000; path was about 40 rods wide; probably 25 miles long. Approximate position of central point: Latitude, $40^{\circ} 45'$; longitude, $94^{\circ} 35'$.

The total casualties for the day were 13 persons injured, with a property loss of \$43,000.

18th.—The Iowa-Illinois tornado had its origin in the northern part of Cedar County, Iowa, about a mile south of the village of Stanwood, at 3:20 p. m., central time. It moved east by north through the northern part of the adjoining county of Clinton until within a few miles of the

Mississippi, when it passed into Jackson County, crossing the Mississippi about $1\frac{1}{2}$ mile south of Sabula at 4:45 p. m. From its origin to where it crossed the Mississippi is about 50 miles as the crow flies. It covered the distance in one hour and twenty-five minutes, or at the rate of 35 miles per hour.

Mr. Thomas Lambert, editor of the Sabula Gazette and a personal witness of the storm, traveled westward from the Mississippi over 33 miles of the storm track. Mr. Lambert is authority for the statement that the funnel cloud was apparently in the air for perhaps a quarter of the way, since there was but slight damage in spots. This fact is of special interest in its bearing upon the life of a tornado. Ordinarily, a tornado does not pursue an uninterrupted course for more than 15 or 20 miles. Indeed, the path of great destruction is generally much less than that distance. In the present case there is undisputed evidence of a severe tornado persisting from 3:20 to 4:45 p. m., and presumptive evidence that it retained its force somewhat longer. The course of the tornado after crossing the Mississippi was as before, viz, east about 20° north. Its passage through Carroll County is not as well attested as might be desired. The only report in the county that we have been able to secure is from Mr. M. N. Wertz, voluntary observer near Lanark. Mr. Wertz gives the time of the tornado as 4:45 p. m., the same time, it will be remembered, that the storm was reported as crossing the Mississippi. Mr. C. E. Nicodemus, postmaster, Forreston, Lee County, about 14 miles east-northeast of Lanark, reports the tornado as passing that place at 5:30 p. m., central time. Assuming that the tornado crossed the Mississippi at 4:45 p. m., it must have increased its rate of progression from 35 to 44 miles per hour in order to reach Forreston at the time given.

It is not altogether clear whether the whirling cloud mass was constantly renewed and projected forward in a somewhat tortuous course, or whether a new whirling cloud formed a little ahead of and to the south of the original storm and traveled in a path parallel to the old storm. The question of the identity of the tornado clouds, viewed at widely separated points, is of considerable importance, since were it known that these storms pursued an undeviating course for a given time, it would not be a difficult matter to warn towns and villages directly in their course.

As tending to show that the same general storm, after devastating eastern Iowa, passed through Carroll County, Ill., it may be stated that many light articles, some of which could be identified as belonging to persons in Iowa, were carried 8, 10, and 12 miles to the northward of the storm track and scattered broadcast over the country. The Weather Bureau observer for Lanark, who lives 8 miles from the storm track in the central portion of Carroll County, had his attention first called to the tornado by a piece of shingle falling on his farm. Likewise farmers living 10 miles north of Sabula, on both sides of the Mississippi, picked up numerous light articles that had been carried thither by the storm winds. One remarkable case was the finding at Pearl City, Ill., 12 miles north of the storm track, of a deed belonging to Mr. Marvin Finton, of Maquoketa, Iowa, 45 miles southwest of the city first named.

When the tornado left Forreston, Lee County, Ill., it was moving to the east bearing a little to the north. Evidence of its farther progress is wanting. Adeline, 6 miles south-east of Forreston, however, reports a tornado as passing that place at 5:50 p. m., central time. The cloud seemed to roll forward on a horizontal axis instead of turning with a spiral motion. Stillman Valley, about fifteen miles southeast of Adeline, was visited by a tornado at 6:05 p. m., central time. The storm approached from the southwest, having its origin 25 or 30 miles from that village. It moved mostly through

timber, devastating a strip about 20 rods wide and continued for about 15 miles northeast of Stillman Valley.

A fourth tornado appears to have developed in Bureau County about $4\frac{1}{2}$ miles northwest of Sheffield. This storm was severe in the neighborhood of Ohio, where about 20 buildings were completely destroyed. It moved thence through a farming community, destroying farm houses and buildings, crossing the Chicago, Burlington and Quincy Railway tracks between Amboy and Shaws, in Lee County. Its course thenceforward can not be traced.

A fifth tornado formed evidently near Sublette, Lee County, and moved northeastward, passing in full view of persons at Compton and Pawpaw, about 6 p. m., central time.

The fatalities in Iowa were as follows: Between Elwood and Delmar, 3; near Delmar, 3; near Riggs, 2; near Preston, 7; total, 15. In Illinois: Carroll County, 3; Ogle County, 11; Lee County, 1; Bureau County, 1; total, 16. The loss to property can not, in the nature of the case, be accurately given. An approximate statement of loss in Iowa fixes the amount at \$150,000; in Illinois, at \$340,000; total in Iowa and Illinois, \$490,000. The above figures are below the estimates made by persons on the ground.

The Iowa tornado had its origin in latitude $41^{\circ} 50'$ N., approximately, longitude $91^{\circ} 10'$ W. It began, as before stated, at 3:20 p. m., central time.

Tornadoes developed in Wisconsin a little later in the afternoon, and it is worthy of notice that the point of origin, viz, in Eau Claire County, is almost identical in longitude with the origin in Iowa. This fact was also noticed on the day previous. Three parallel bands of tornadoes were observed. The first in point of time had its origin, as above stated, in Eau Claire County, between 4 and 5 p. m., central time. It moved northeastward and apparently disappeared in Clark County. The next report of a tornado was received from Abbotsford, in the northeastern corner of Clark County. From Abbotsford to Antigo is 63 miles. The course of the storm between the two places seems to have been well observed. There is a discrepancy, however, between the time given for the storm's appearance at Granite Heights and Antigo. Both observers report the storm as appearing at 6:40 p. m. Since the distance between the two places is about 20 miles, it is possible that one and the same storm did not visit both places. Antigo, where the last damage was done, lies east 20° north and 110 miles distant from the point where tornadic action was first observed. There was very great destruction throughout the entire length of the tornado in Marathon County up to the time it crossed the Wisconsin River at Granite Heights. Between that point and Antigo, where 3 persons were killed and between 30 and 40 severely injured, the damage appears to have been slight. A second group of tornadoes originated in Price and Lincoln counties and moved northeastward, disappearing in Oneida County at 6:30 p. m., central time. A third group originated in Dane County a little southwest of Madison and moved northeastward in a comparatively short track, disappearing between 6 and 7 o'clock in the same county. Tornado funnel clouds were observed at various times between 3:30 and 5:30 p. m. by the Weather Bureau observer at Madison.

Sixteen persons were killed in Wisconsin—2 in Eau Claire County, 2 in Oneida County, and 12 in Marathon and Langlade counties. Upward of 100 people were injured.

The property loss in the Dane County tornado was from \$8,000 to \$10,000; Eau Claire County, about \$25,000; Marathon and Langlade counties, probably \$150,000, aside from loss to timber; Oneida County, probably \$25,000, in addition to which from twenty to thirty million feet of timber were blown down.

Loss of life for the day, 47. Property loss, \$700,000, not including timber.

19th.—Tornadic activity was renewed on the 19th at two points in the Indian Territory, viz, Ardmore and Davis. The funnel cloud appeared at Ardmore at 8:15 p. m., central time. Three persons were injured; the property loss was about \$4,000; path of greatest destruction was 50 feet wide and 1 mile long. At Davis, 1 person was killed and several buildings were destroyed. No further particulars obtainable.

20th.—Tornadoes were observed at widely separated points in Texas, Kansas, Arkansas, Missouri, and Illinois.

The first in point of time was observed to the southeast of Salina, Kans. As many as three funnel clouds were seen at one time; these moved to the northeast in a path about 8 miles long, between 3 and 4 p. m., central time. One man was killed and several farm houses destroyed.

A minor tornado moved northeastward near Severy, Kans., about 6 p. m., central time. Twelve persons were injured and the property loss was about \$3,000. The path of great destruction was less than 3 miles long and from 50 to 300 feet wide.

A third tornado was observed at 7 p. m., central time, in Washington County, Ark. Two people were killed and 11 were injured; the property loss was \$15,000, aside from the loss to orchards and timber. The path of the storm was about 80 yards wide and 10 miles long, and it moved at a rate of 32 miles per hour.

A fourth tornado struck Ravenna, Fannin Co., Tex., at 7:30 p. m., central time; two persons slightly injured; property loss in Ravenna, \$8,000; tornado moved northeast; path about 15 miles long, 100 to 300 yards wide.

About 8:30 p. m., central time, a tornado formed in Barry County, Mo., near the Arkansas line. It moved through the central portion of Stone County, through Christian County, and disappeared in Webster County. It is quite probable that the path of great destruction was not continuous throughout these counties. The destruction was confined principally to farm houses and implements, orchards, fences, bridges, etc. Probably as many as 20 dwelling houses and a larger number of barns were destroyed in its course. The loss is estimated at \$20,000.

A minor tornado was observed in Henderson County, Ill., passing near the towns of Raritan and Ellison, about 5 p. m., central time. The tornado cloud evidently touched the earth over but a small portion of its course. The property loss was estimated at \$3,500.

25th.—A tornado passed from the southwest to the northeast corner of Morton County, Kans., latitude 37° , longitude 102° , destroying buildings and windmills, etc., in its course. Tornadoes rarely occur as far west as the one hundred and second meridian, but this appears to be a very well authenticated case of a storm of considerable violence developing and persisting for some time in this region.

27th.—Near Scandia, Kans., 7 p. m., central time, 2 persons injured; property loss, \$2,500. The tornado cloud lifted and descended at intervals in a path 6 to 8 miles long.

31st.—Dekalb County, Mo. First observed in the western part of the county near Orchid at 4:15 p. m., central time. It passed Fairport, in the north-central portion of the county, at 4:30 p. m. Four persons were killed and 6 were injured. It is estimated that the money loss aggregated fully \$30,000. The length of the path of great destruction was approximately 25 miles. Some minor damage was done in Daviess County in the line of the tornado after leaving Dekalb.

The maximum wind velocity at each Weather Bureau station for a period of five minutes is given in Table I, which also gives the altitude of Weather Bureau anemometers above ground.

Following are the velocities of 50 miles and over per hour registered during the month:

Maximum wind velocities.

Stations.	Date.	Velocity.	Direction.	Stations.	Date.	Velocity.	Direction.
Amarillo, Tex	8	64	w.	Hatteras, N. C	30	56	nw.
Do.	23	52	w.	Havre, Mont	28	52	e.
Do.	30	56	w.	Huron, S. Dak	17	54	se.
Do.	30	50	sw.	St. Louis, Mo	1	62	w.
Block Island, R. I.	22	52	ne.	Do.	11	56	w.
Do.	22	54	ne.	Sioux City, Iowa	17	53	sw.
Fort Canby, Wash.	21	52	se.				

SUNSHINE AND CLOUDINESS.

The quantity of sunshine, and therefore of heat, received by the atmosphere as a whole is very nearly constant from year to year, but the proportion received by the surface of the earth depends upon the absorption by the atmosphere, and varies largely with the distribution of cloudiness. The sunshine is now recorded automatically at 21 regular stations of the Weather Bureau by its photographic and at 47 by its thermal effects. The photographic record sheets show the apparent solar time, but the thermometric records show seventy-fifth meridian time; for convenience the results are all given in Table IX for each hour of local mean time. In order to complete the record of the duration of cloudiness these registers are supplemented by special personal observations of the state of the sky near the sun for an hour after sunrise and before sunset, and the cloudiness for these hours has been added as a correction to the instrumental records, whence there results a complete record of the duration of sunshine from sunrise to sunset.

The average cloudiness of the whole sky is determined by numerous personal observations at all stations during the daytime, and is given in the column "average cloudiness" in Table I; its complement, or percentage of clear sky, is given in the last column of Table IX for the stations at which instrumental self-registers are maintained.

The percentage of clear sky (sunshine) for all of the stations included in Table I, obtained as described in the preceding paragraph, is graphically shown on Chart VII. The regions of cloudy and overcast skies are shown by heavy shading; an absence of shading indicates, of course, the prevalence of clear, sunshiny weather.

The formation of fog and cloud is primarily due to differences of temperature in a relatively thin layer of air next to the earth's surface. The relative position of land and water surfaces often greatly increases the tendency to form areas of cloud and fog. This principle is perhaps better exemplified in the Lake region than elsewhere, although it is of quite general application. The percentage of sunshine on the lee shores of the Lakes is always much less than on the windward shores. Next to the permanent influences that tend to form fog and cloud may be classed the frequency of the passage of cyclonic areas.

The current month.—The month was one of bright sunshine in the Southwest and over a considerable portion of the Gulf

States; especially is this true of western Florida, Georgia, and southern Alabama. The sunshine in the Lake region was about normal. There was, however, a very considerable area in the Missouri Valley, westward, including Nebraska, northern Colorado, Wyoming, southern Montana, northern Utah, Idaho, and a portion of Washington and Oregon, over which the sunshine was very much less than usual. The precise limits of this region can readily be seen by examining Chart VII. It will be noted, in connection with this chart, that at no time since the first of the year has there been so little sunshine over so great an extent in the interior of the country.

Average cloudiness and departures from the normal.

Districts.	Average.	Departure from the normal.	Districts.	Average.	Departure from the normal.
New England	6.6	+1.1	Missouri Valley	6.2	+0.8
Middle Atlantic	6.2	+1.0	Northern Slope	6.5	+1.1
South Atlantic	3.6	-0.8	Middle Slope	5.4	+0.6
Florida Peninsula	2.4	-2.1	Southern Slope	4.0	-0.5
East Gulf	2.9	-1.4	Southern Plateau	2.6	+0.4
West Gulf	4.7	-0.2	Middle Plateau	5.3	+2.2
Ohio Valley and Tennessee ..	4.7	-0.4	Northern Plateau	5.2	-0.4
Lower Lake	6.2	+1.0	North Pacific Coast	5.3	-0.6
Upper Lake	5.2	-0.3	Middle Pacific Coast	5.4	+1.2
North Dakota	4.4	-0.9	South Pacific Coast	4.0	-0.2
Upper Mississippi Valley ..	5.6	+0.4			

ATMOSPHERIC ELECTRICITY.

Numerical statistics relative to auroras and thunderstorms are given in Table IX, which shows the number of stations from which meteorological reports were received, and the number of such stations reporting thunderstorms (T) and auroras (A) in each State and on each day of the month, respectively.

Thunderstorms.—The dates on which the number of reports of thunderstorms for the whole country were most numerous were: 19th, 425; 20th, 304; 21st, 281; 18th, 267; 16th, 237; 15th, 212.

Reports were most numerous from Missouri, 370; Ohio, 321; Illinois, 284; North Carolina, 215.

Auroras.—The evenings on which bright moonlight must have interfered with observations of faint auroras are assumed to be the four preceding and following the date of full moon, viz, from the 1st to the 9th.

The greatest number of reports were received for the following dates: 29th, 13; 9th, 11; 15th and 30th, 3.

Reports were most numerous from Wisconsin, 13; North Dakota, 8; Ohio, 7; Minnesota, 4.

In Canada.—Auroras were reported as follows: Father Point, 8, 9, 10; Quebec, 30, 31; White River, 4, 30; Minnedosa, 27, 30; Swift Current, 11; Prince Albert, 13, 29.

Thunderstorms were reported as follows: Father Point, 12; Quebec, 20; Montreal, 14, 19, 22; Rockliffe, 11; Toronto, 11, 19, 22, 23; Port Stanley, 3, 11, 19, 20; Saugeen, 11, 19; Parry Sound, 11, 18, 19, 22; Port Arthur, 9; Minnedosa, 25; Qu'Appelle, 24; Swift Current, 23, 30; Calgary, 18; Kamloops, 17, 21; Esquimalt, 26.

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following extracts relating to the general weather conditions in the several States and Territories are taken from the monthly reports of the respective sections of the Climate and Crop Service. The name of the section director is given after each summary.

Rainfall is expressed in inches.

REV—2

Alabama.—The mean temperature was 73.6°, or 2.6° above normal, the highest was 101°, at Eufaula on the 30th, and the lowest, 33°, at Valleyhead on the 7th. The average precipitation was 0.82, or 3.06 below normal; the greatest monthly amount, 3.05, occurred at River-ton, while none fell at Citronelle and Wilsonville.—*F. P. Chaffee.*

Arizona.—The mean temperature was 67.8°; the highest was 109°, at Parker on the 10th and 11th, and the lowest, 23°, at Williams on the 5th. The average precipitation was 0.39; the greatest monthly amount,

4.90, occurred at Flagstaff, while no rain fell at many stations.—*W. T. Blythe.*

Arkansas.—The mean temperature was 72.1°, or 3.4° above normal; the highest was 100°, at Lutherville on the 29th, and the lowest, 30°, at Pond on the 7th. The average precipitation was 6.44, or 1.37 above normal; the greatest monthly amount, 14.28, occurred at Dallas, and the least, 1.22, at Elon.—*E. B. Richards.*

California.—The mean temperature was 61.3°, or 4.5° below normal; the highest was 109°, at Volcano Springs on the 11th, and at Salton on the 22d and 26th, and the lowest, 14°, at Bodie on the 20th. The average precipitation was 1.56, or 0.61 above normal; the greatest monthly amount, 8.27, occurred at Morses House.—*W. H. Hammon.*

Colorado.—The mean temperature was 50.2°, or 3.0° below normal; the highest was 93°, at Lamar on the 23d, and the lowest, 8°, near Longs Peak on the 2d, and at Lake Moraine on the 6th. The average precipitation was 3.61, or 1.58 above normal; the greatest monthly amount, 9.14, occurred at Ruby, and the least, 0.46, at Breckenridge.—*F. H. Brandenburg.*

Florida.—The mean temperature was 76.4°, or slightly above normal; the highest was 102°, at Minneota Park on the 28th, and the lowest, 41°, at St. Francis on the 8th. The average precipitation was decidedly below normal, and was the driest May for several years; the greatest monthly amount, 6.16, occurred at Huntington, and the least, 0.04, at Pensacola.—*A. J. Mitchell.*

Georgia.—The mean temperature was 74.0°, or 3.1° above normal; the highest was 103°, at Albany on the 29th, and the lowest, 35°, at Diamond, Ramsey, and Unionpoint on the 7th. The average precipitation was 1.12, or 1.93 below normal; the greatest monthly amount, 3.66, occurred at Elberton, and the least, 0.16, at Ramsey.—*J. B. Marbury.*

Idaho.—The mean temperature was 53.3°; the highest was 96°, at Payette on the 11th, and the lowest, 20°, at Lake on the 1st. The average precipitation was 2.43; the greatest monthly amount, 5.26, occurred at Gimlet, and the least, 0.29, at Marysville.—*D. P. McCallum.*

Illinois.—The mean temperature was 62.2°, or about normal; the highest was 93°, at Equality on the 28th, and the lowest, 30°, at Scales Mound on the 6th and at Lanark on the 12th. The average precipitation was 5.78, or 1.55 above normal; the greatest monthly amount, 9.55, occurred at Carlyle, and the least, 2.23, at Chicago.—*C. E. Linney.*

Indiana.—The mean temperature was 63.1°, or 1.3° above normal; the highest was 92°, at Mount Vernon and Crawfordsville on the 25th, and the lowest, 30°, at Hector and Knox on the 14th. The average precipitation was 4.49, or 0.28 above normal; the greatest monthly amount, 10.57, occurred at Crawfordsville, and the least, 2.09, at Franklin.—*C. F. R. Wappenhans.*

Iowa.—The mean temperature was 59.6°, or about normal; the highest was 92°, at Odebolt on the 24th and at College Springs on the 25th, and the lowest, 26°, at Rock Rapids on the 6th. The average precipitation was 4.67, or slightly above normal; the greatest monthly amount, 7.82, occurred at Fort Madison, and the least, 2.22, at Estherville.—*G. M. Chappel.*

Kansas.—The mean temperature was 62.9°, or 0.6° below normal; the highest was 95°, at Delphos on the 11th, and at Meade on the 23d, and the lowest, 29°, at Coolidge on the 6th. The average precipitation was 6.28, or 2.34 above normal; the greatest monthly amount, 11.88, occurred at Olathe, and the least, 2.62, at Delphos.—*T. B. Jennings.*

Kentucky.—The mean temperature was 67.6°, or 2.2° above normal; the highest was 93°, at Paducah on the 24th, and the lowest, 31°, at Owenton on the 6th. The average precipitation was 4.52, or 0.50 above normal; the greatest monthly amount, 6.46, occurred at Earlington, and the least, 2.50, at Edmonton.—*G. E. Hunt.*

Louisiana.—The mean temperature was 74.7°, or about 1.0° above normal; the highest was 98°, at Minden on the 24th, at Amite and Liberty Hill on the 31st; the lowest was 36°, at Robeline on the 7th and 8th. The average precipitation was 1.15, or nearly 2.00 below normal; the greatest monthly amount, 4.38, occurred at Mansfield, while none fell at Plaquemine, and only sprinkles at several stations.—*R. E. Kerkam.*

Maryland and Delaware.—The mean temperature was 62.9°, or 0.3° below normal; the highest was 96°, at Taneytown, Md., on the 1st, and at Milford, Del., on the 20th; the lowest was 25°, at Deepark, Md., and Sunnyside, Md., on the 9th. The average precipitation was 4.47, or 0.26 above normal; the greatest monthly amount, 12.29, occurred at Bachmans Valley, Md., and the least, 2.30, at Hagerstown, Md.—*F. J. Wals.*

Michigan.—The mean temperature was 55.1°, or 1.2° above normal; the highest was 88°, at Clinton on the 23d, and the lowest, 20°, at Humboldt on the 4th. The average precipitation was 2.53, or 1.00 below normal; the greatest monthly amount, 6.23, occurred at Baraga, and the least, 1.20, at Mount Clemens.—*C. F. Schneider.*

Minnesota.—The mean temperature was 55.6°, or about normal; the highest was 92°, at Ada on the 24th, and the lowest, 20°, at Koochiching on the 3d. The average precipitation was 3.26, or about normal; the greatest monthly amount, 6.02, occurred at Mapleplain, and the least, 0.89, at Roseau.—*T. S. Outram.*

Mississippi.—The mean temperature was 74.2°, or 1.9° above normal; the highest was 101°, at Aberdeen on the 29th and 31st, and the lowest, 37°, at French Camp on the 8th. The average precipitation was

2.21, or 1.94 below normal; the greatest monthly amount, 5.29, occurred at Batesville, while none fell at Mosspoint.—*R. J. Hyatt.*

Missouri.—The mean temperature was 65.2°, or 1.0° above normal; the highest was 97°, at Eldon on the 25th, and the lowest, 31°, at Potosi on the 6th. The average precipitation was 7.92, or 2.69 above normal; the greatest monthly amount, 19.22, occurred at Sublett, and the least, 4.62, at Arthur.—*A. E. Hackett.*

Montana.—The mean temperature was 50.4°, or about 2.0° below normal; the highest was 90°, at Fort Keogh on the 23d, and the lowest, 10°, at Boulder on the 3d. The average precipitation was 3.56, somewhat above normal; the greatest monthly amount, 12.63, occurred at Red Lodge, and the least, 0.14, at St. Pauls.—*J. Warren Smith.*

Nebraska.—The mean temperature was 57.2°, or about 2.0° below normal; the highest was 98°, at Franklin on the 22d, and at Aurora on the 31st, and the lowest, 27°, at Kimball on the 1st, and at Lexington on the 5th. The average precipitation was 4.86, or about 1.00 above normal; the greatest monthly amount, 8.90, occurred at Thedford, and the least, 1.38, at Norden.—*G. A. Loveland.*

Nevada.—The mean temperature was 51.8°, or 3.5° below normal; the highest was 93°, at Panaca on the 11th, and the lowest, 20°, at Elko on the 20th. The average precipitation was 1.84, or about double the usual amount; the greatest monthly amount, 4.18, occurred at Austin, and the least, trace, at Hot Springs.—*R. F. Young.*

New England.—The mean temperature was 54.6°, or 0.9° below normal; the highest was 86°, North Norwalk, Conn., on the 20th, and at North Conway, N. H., on the 29th; the lowest was 14°, at Berlin Mills, N. H., on the 1st. The average precipitation was 4.38, or 0.49 above normal; the greatest monthly amount, 8.96, occurred at Narragansett Pier, R. I., and the least, 1.02, at Orono, Me.—*J. W. Smith.*

New Jersey.—The mean temperature was 58.5°, or 2.3° below normal; the highest was 93°, at Beverly, Bridgeton, and Flemington on the 20th, and the lowest, 29°, at Belvidere and Franklin Furnace on the 9th. The average precipitation was 7.00, the largest on record, or 2.82 above normal; the greatest monthly amount, 9.26, occurred at Oceanic, and the least, 3.92, at Cape May City.—*E. W. McGann.*

New Mexico.—The mean temperature was 59.3°, or 2.1° below normal; the highest was 100°, at Shattucks on the 25th, and the lowest, 19°, at Buckmans on the 21st. The average precipitation was 0.53, or 0.67 below normal; the greatest monthly amount, 2.07, occurred at Clayton, while none fell at Fort Bayard and Whiteoaks.—*R. M. Hardinge.*

New York.—The mean temperature was 56.5°, or 0.2° above normal; the highest was 90°, at Brooklyn and Brentwood on the 20th, and the lowest, 26°, at Saranac Lake on the 8th. The average precipitation was 4.09, or 0.50 above normal; the greatest monthly amount, 11.50, occurred at Brentwood, and the least, 1.66, at Buffalo.—*R. G. Allen.*

North Carolina.—The mean temperature was 68.5°, or about 1.5° above normal; the highest was 104°, at Goldsboro on the 30th, and the lowest, 27°, at Highlands on the 7th. The average precipitation was 3.69, or about 0.50 below normal; the greatest monthly amount, 10.03, occurred at Edenton, and the least, 0.76, at Southport.—*C. F. von Herrmann.*

North Dakota.—The mean temperature was 52.5°, or 1.1° below normal; the highest was 92°, at Wahpeton on the 23d, and the lowest, 14°, at Gallatin on the 11th. The average precipitation was 2.05, or 0.59 below normal; the greatest monthly amount, 4.56, occurred at Kelso, and the least, 0.01, at McKinney.—*B. H. Bronson.*

Ohio.—The mean temperature was 61.0°, or about 1.0° above normal; the highest was 92°, at Logan, Portsmouth, and Waverly on the 21st, and the lowest, 29°, at Hillhouse on the 9th. The average precipitation was 4.10, or about normal; the greatest monthly amount, 6.39, occurred at Granville, and the least, 2.07, at Cleveland.—*H. W. Richardson.*

Oklahoma.—The mean temperature was 68.9°; the highest was 101°, at Kemp on the 29th, and the lowest, 31°, at Fort Reno on the 2d. The average precipitation was 8.16; the greatest monthly amount, 13.38, occurred at Winnview, and the least, 2.73, at Beaver.—*J. I. Widmeyer.*

Oregon.—The mean temperature was 53.9°, or 0.6° below normal; the highest was 93°, at Prineville on the 11th, and the lowest, 19°, at Happy Valley and Silverlake on the 7th. The average precipitation was 2.18, or 0.39 below normal; the greatest monthly amount, 6.23, occurred at Langlois, and the least, 0.03, at The Dalles.—*B. S. Pague.*

Pennsylvania.—The mean temperature was 60.0°, or 0.9° above normal; the highest was 94°, at Coatesville on the 20th, and the lowest, 22°, at Dushore on the 9th. The average precipitation was 5.11, or 0.32 above normal; the greatest monthly amount, 10.15, occurred at Point Pleasant, and the least, 2.79, at Erie.—*T. F. Townsend.*

South Carolina.—The mean temperature was 73.8°, or 3.0° above normal; the highest was 106°, at Gillisonville on the 30th, and the lowest, 39°, at Central and Greenville on the 8th. The average precipitation was 1.35, or 2.67 below normal; the greatest monthly amount, 6.31, occurred at Trial, and the least, 0.50, at Longshore.—*J. W. Bauer.*

South Dakota.—The mean temperature was 55.0°, or about 1.0° below normal; the highest was 100°, at Cherry Creek on the 23d, and the lowest, 17°, at Cherry Creek on the 6th. The average precipitation was 4.52, or 1.28 above normal; the greatest monthly amount, 9.42, occurred at Sioux Falls, and the least, 2.01, at Ipswich.—*S. W. Glenn.*

Texas.—The mean temperature for the State during the month, determined by comparison of 38 stations distributed throughout the State,

was 0.8° above the normal. There was a slight deficiency over the panhandle, west Texas, and the central portion of the coast district, while there was a general excess over the other portions of the State, being slight over the east and west portions of the coast district and ranging from 1° to about 3° over the other portions, with the greatest excess over the central portion of north Texas. The highest was 107°, at Fort McIntosh on the 19th, and the lowest, 32°, at Amarillo on the 6th. The average precipitation for the State during the month, determined by comparison of 40 stations distributed throughout the State, was 0.71 below the normal. There was a general excess over the panhandle and the western portions of central and north Texas, with the greatest, 4.23, in the vicinity of Brownwood, while there was a general deficiency elsewhere, ranging from about 1.00 to 4.53, with the greatest in the vicinity of Houston. The greatest monthly amount, 7.59, occurred at Coleman, while none fell at Fort Clark.—*I. M. Cline.*

Utah.—The mean temperature was 53.2°, the highest was 94°, at St. George on the 12th, and the lowest, 20°, at Loa on the 3d and at Soldier Summit on the 20th. The average precipitation was 3.02, or considerably above normal; the greatest monthly amount, 7.04, occurred at Heber, and the least, 0.61, at Fort Duchesne.—*J. H. Smith.*

Virginia.—The mean temperature was 65.6°, or slightly above normal; the highest was 98°, at Ballsville and Doswell on the 20th, and the lowest, 30°, at Dale Enterprise on the 9th. The average precipitation

was 5.35, or 0.91 above normal; the greatest monthly amount, 9.08, occurred at Lynchburg, and the least, 3.53, at Buckingham.—*E. A. Evans.*

Washington.—The mean temperature was 55.2, or nearly normal; the highest was 92°, at Kennewick on the 25th, and at Lind on the 26th, and the lowest, 24°, at Centerville on the 31st. The average precipitation was 1.81, or about 0.50 below normal; the greatest monthly amount, 5.06, occurred at Clearwater, and the least, 0.12, at Ellensburg.—*G. N. Salisbury.*

West Virginia.—The mean temperature was 63.0°, or about 1.5° above normal; the highest was 94°, at Eastbank on the 21st, and the lowest, 28°, at Beverly on the 9th. The average precipitation was 4.51, or slightly above normal; the greatest monthly amount, 6.15, occurred at Beverly, and the least, 2.76, at Parkersburg.—*C. M. Strong.*

Wisconsin.—The mean temperature was 55.7°, or nearly normal; the highest was 89°, at Chat on the 7th, at Knapp on the 23d, and at Prairie du Chien on the 24th. The average precipitation was 2.84, or 0.85 below normal; the greatest monthly amount, 6.60, occurred at Osceola, and the least, 1.10, at La Crosse.—*W. M. Wilson.*

Wyoming.—The mean temperature was 48.0°, or 2.3° below normal; the highest was 89°, at Fort Laramie on the 31st, and the lowest, 15°, at Sheridan on the 6th. The average precipitation was 3.78, or 1.72 above normal; the greatest monthly amount, 6.02, occurred at Lander, and the least, 1.46, at Bigpiny.—*W. S. Paumer.*

SPECIAL CONTRIBUTIONS.

MOISTURE TABLES.

By Prof. C. F. MARVIN.

The quantity of moisture mixed with the air under different conditions as to temperature and degree of saturation often plays an important part in the operation of blast furnaces, drying kilns, cotton mills, steel mills, etc. The metallurgist, especially, is awakening to the importance of taking full account of the moisture in the air that incidentally, or designedly, is often a part of extensive chemical operations involved in the production of steel and iron.

From time to time letters requesting information on these questions have been received by the Chief of the Weather Bureau, and it has seemed advisable to publish a general answer to such inquiries in the shape of the following notes and table.

The weight of a unit volume of vapor is given in the revised editions of meteorological tables only for conditions of complete saturation, whereas, in ordinary practice we deal nearly always with cases of partial saturation, and it is believed the table below will be useful to many and obviate the necessity of special computations.

Faulty conceptions.—A false notion that the air has a certain capacity for moisture is widely prevalent, and is perpetuated by all such expressions as "The air is partly saturated with moisture," "Weight of aqueous vapor in a cubic foot of saturated air," etc.

It should always be clearly observed that the presence of the moisture in any given space is independent of the presence or absence of air in the same space except that the air retards the diffusion of the vapor particles. It is more correct to say, in the above cases, that the space is partly saturated with moisture, or the moisture is partly saturated or is superheated. By all means use the phrase "Weight of a cubic foot of saturated aqueous vapor," not "Weight of aqueous vapor in a cubic foot of saturated air."

The amount of saturated aqueous vapor that can exist in any given space depends entirely upon the temperature. It appears that the vapor may be supersaturated under certain peculiar conditions, but this is a special and an unstable state which need not be considered in the present connection. When the vapor is saturated, it will exert a certain pressure which varies with the temperature and which so-called "maximum pressure" has been measured with greater or less precision over a long range of temperature from about 60° below zero F., to far above the boiling point of water.

Saturated aqueous vapor is but little more than half as heavy as the same volume of air under like conditions of temperature and pressure, and, in all ordinary computations it is assumed that the expansion and contraction of partially saturated aqueous vapor is in accordance with the same laws as apply to air and ordinary gases, which do not easily condense to the liquid state.

The adopted density of saturated aqueous vapor is not determined directly from experiment, but is deduced theoretically from the observed fact that two volumes of hydrogen and one of oxygen combine to produce two volumes of water vapor.

The weights of unit volumes of hydrogen, oxygen, and dry air are accurately known, from which the specific gravity of aqueous vapor is found to be 0.6221.

The weight of a cubic meter of saturated aqueous vapor is given by the equation:

$$W = 0.6221 \frac{A}{1 + kt} \frac{F}{760}$$

in which t is the temperature, centigrade, and F the corresponding pressure, in millimeters, at saturation. A is the weight of a cubic meter of air, under standard conditions = 1.29278 kilogram, k is the coefficient of expansion of air = 0.003667.

If English units of temperature, pressure, and weight are used, we find the weight of a cubic foot of saturated aqueous vapor in grains is:

$$W = 11.7459 \frac{F}{1 + 0.002037(t - 32)}$$

This formula gives the weights found in the column headed "100" in the accompanying table. Above 32° the values of F employed were those deduced from Regnault's observations, by Broch, for the International Bureau of Weights and Measures. Broch's reduction is unsatisfactory for temperatures below 32°, and this portion of the table is based upon saturation pressures experimentally observed by the writer and described in Appendix 10, Annual Report of the Chief Signal Officer, 1891.

When the water vapor present in any given space is not saturated, this fact is generally expressed by the degree of humidity assigned to it. For example, we say the relative humidity, that is the percentage of saturation, is 60. This means that only 60 per cent of the vapor that might at the prevailing temperature exist in the space under consideration is present; hence, 40 per cent more vapor must be added in

order that the space may be saturated. We may deduce the percentages of saturation either as a ratio of the weights, or as a ratio of pressures, with identical results, because in all such computations it is assumed without important errors that partially saturated vapor expands and compresses strictly proportional to the temperature and pressure. From this it follows that the weight of vapor at a given percentage of saturation is found by multiplying the weight corresponding to saturation by the relative humidity.

Weight of a cubic foot of aqueous vapor at different temperatures and percentages of saturation.

Temperature, ° F.	Percentage of saturation.									
	10	20	30	40	50	60	70	80	90	100
	Grains.									
-20	0.017	0.033	0.050	0.066	0.083	0.100	0.116	0.133	0.149	0.166
-19	0.017	0.035	0.052	0.070	0.087	0.104	0.122	0.139	0.157	0.174
-18	0.018	0.037	0.055	0.074	0.092	0.110	0.129	0.147	0.166	0.184
-17	0.020	0.039	0.059	0.078	0.098	0.118	0.137	0.157	0.176	0.196
-16	0.021	0.041	0.062	0.083	0.104	0.124	0.145	0.166	0.186	0.207
-15	0.022	0.044	0.065	0.087	0.109	0.131	0.153	0.174	0.196	0.218
-14	0.023	0.046	0.069	0.092	0.116	0.139	0.162	0.185	0.208	0.231
-13	0.024	0.049	0.073	0.097	0.122	0.146	0.170	0.194	0.219	0.243
-12	0.026	0.051	0.077	0.103	0.128	0.154	0.180	0.206	0.231	0.257
-11	0.027	0.054	0.081	0.108	0.135	0.162	0.189	0.216	0.243	0.270
-10	0.028	0.057	0.086	0.114	0.142	0.171	0.200	0.228	0.256	0.285
-9	0.030	0.060	0.090	0.120	0.150	0.180	0.210	0.240	0.270	0.300
-8	0.032	0.063	0.095	0.126	0.158	0.190	0.221	0.253	0.284	0.316
-7	0.033	0.066	0.100	0.133	0.166	0.199	0.232	0.266	0.299	0.332
-6	0.035	0.070	0.105	0.140	0.175	0.210	0.245	0.280	0.315	0.350
-5	0.037	0.074	0.111	0.148	0.185	0.222	0.259	0.296	0.333	0.370
-4	0.039	0.078	0.117	0.156	0.194	0.233	0.272	0.311	0.350	0.389
-3	0.041	0.082	0.123	0.164	0.206	0.247	0.288	0.329	0.370	0.411
-2	0.043	0.087	0.130	0.174	0.217	0.260	0.304	0.347	0.391	0.434
-1	0.046	0.091	0.137	0.183	0.228	0.274	0.320	0.366	0.411	0.457
0	0.048	0.096	0.144	0.192	0.240	0.289	0.337	0.385	0.433	0.481
+1	0.050	0.101	0.152	0.202	0.252	0.303	0.354	0.404	0.454	0.505
+2	0.053	0.106	0.159	0.212	0.264	0.317	0.370	0.423	0.476	0.529
+3	0.055	0.111	0.166	0.222	0.277	0.332	0.388	0.443	0.499	0.554
+4	0.058	0.116	0.175	0.233	0.291	0.349	0.407	0.466	0.524	0.582
+5	0.061	0.122	0.183	0.244	0.305	0.366	0.427	0.488	0.549	0.610
+6	0.064	0.128	0.192	0.256	0.320	0.383	0.447	0.511	0.575	0.639
+7	0.067	0.134	0.201	0.268	0.336	0.403	0.470	0.537	0.604	0.671
+8	0.070	0.141	0.211	0.282	0.352	0.422	0.493	0.563	0.634	0.704
+9	0.074	0.148	0.222	0.296	0.370	0.443	0.517	0.591	0.665	0.739
+10	0.078	0.155	0.233	0.310	0.388	0.466	0.543	0.621	0.698	0.776
+11	0.082	0.163	0.245	0.326	0.408	0.490	0.571	0.653	0.734	0.816
+12	0.086	0.171	0.257	0.342	0.428	0.514	0.599	0.685	0.770	0.856
+13	0.090	0.180	0.269	0.359	0.449	0.539	0.629	0.718	0.808	0.898
+14	0.094	0.188	0.282	0.376	0.470	0.565	0.659	0.753	0.847	0.941
+15	0.099	0.197	0.296	0.394	0.490	0.592	0.690	0.789	0.887	0.986
+16	0.103	0.206	0.310	0.413	0.516	0.619	0.722	0.826	0.929	1.032
+17	0.108	0.216	0.324	0.432	0.540	0.648	0.756	0.864	0.972	1.080
+18	0.113	0.226	0.338	0.451	0.564	0.677	0.790	0.902	1.015	1.128
+19	0.118	0.236	0.354	0.472	0.590	0.709	0.827	0.945	1.063	1.181
+20	0.124	0.247	0.370	0.494	0.618	0.741	0.864	0.988	1.112	1.235
+21	0.129	0.259	0.388	0.518	0.647	0.776	0.906	1.035	1.165	1.294
+22	0.136	0.271	0.406	0.542	0.678	0.813	0.948	1.084	1.220	1.355
+23	0.142	0.284	0.425	0.567	0.709	0.851	0.993	1.134	1.276	1.418
+24	0.148	0.297	0.445	0.593	0.742	0.890	1.038	1.186	1.335	1.483
+25	0.155	0.310	0.465	0.620	0.776	0.931	1.086	1.241	1.396	1.551
+26	0.162	0.325	0.487	0.649	0.812	0.974	1.136	1.298	1.461	1.623
+27	0.170	0.339	0.509	0.679	0.848	1.018	1.188	1.358	1.527	1.697
+28	0.177	0.355	0.532	0.709	0.886	1.064	1.241	1.418	1.596	1.773
+29	0.185	0.371	0.556	0.741	0.926	1.112	1.297	1.482	1.668	1.853
+30	0.194	0.387	0.580	0.774	0.968	1.161	1.354	1.548	1.742	1.935
+31	0.202	0.404	0.607	0.809	1.011	1.213	1.415	1.618	1.820	2.022
+32	0.211	0.422	0.634	0.845	1.056	1.268	1.479	1.690	1.902	2.113
+33	0.219	0.439	0.658	0.878	1.097	1.316	1.536	1.755	1.975	2.194
+34	0.228	0.456	0.684	0.912	1.140	1.367	1.595	1.823	2.051	2.279
+35	0.237	0.473	0.710	0.946	1.183	1.420	1.656	1.893	2.129	2.366
+36	0.246	0.491	0.737	0.983	1.228	1.474	1.720	1.966	2.211	2.457
+37	0.255	0.510	0.765	1.020	1.275	1.530	1.785	2.040	2.295	2.550
+38	0.265	0.529	0.794	1.058	1.323	1.588	1.852	2.117	2.381	2.646
+39	0.275	0.549	0.824	1.098	1.373	1.648	1.922	2.197	2.471	2.746
+40	0.285	0.570	0.855	1.140	1.424	1.709	1.994	2.279	2.564	2.849
+41	0.296	0.591	0.886	1.182	1.478	1.773	2.068	2.364	2.660	2.955
+42	0.306	0.613	0.919	1.226	1.532	1.838	2.145	2.451	2.758	3.064
+43	0.318	0.635	0.953	1.271	1.588	1.906	2.224	2.542	2.859	3.177
+44	0.329	0.659	0.988	1.318	1.647	1.976	2.306	2.635	2.965	3.294
+45	0.341	0.683	1.024	1.366	1.707	2.048	2.390	2.731	3.073	3.414
+46	0.354	0.708	1.062	1.416	1.770	2.123	2.477	2.831	3.185	3.539
+47	0.367	0.733	1.100	1.467	1.834	2.200	2.567	2.934	3.300	3.667
+48	0.380	0.760	1.140	1.520	1.900	2.280	2.660	3.040	3.420	3.800
+49	0.394	0.787	1.181	1.574	1.968	2.362	2.755	3.149	3.542	3.936

Weight of a cubic foot of aqueous vapor, etc.—Continued.

Temperature, ° F.	Percentage of saturation.									
	10	20	30	40	50	60	70	80	90	100
	Grains.									
+50	0.408	0.815	1.223	1.630	2.038	2.446	2.853	3.261	3.668	4.076
51	0.422	0.844	1.267	1.689	2.111	2.533	2.955	3.378	3.800	4.222
52	0.437	0.874	1.312	1.749	2.186	2.623	3.060	3.498	3.935	4.372
53	0.453	0.905	1.358	1.810	2.263	2.716	3.168	3.621	4.073	4.526
54	0.468	0.937	1.406	1.874	2.342	2.811	3.280	3.748	4.216	4.685
55	0.485	0.970	1.455	1.940	2.424	2.909	3.394	3.879	4.364	4.849
56	0.502	1.003	1.505	2.006	2.508	3.010	3.511	4.013	4.514	5.016
57	0.519	1.038	1.557	2.076	2.596	3.115	3.634	4.153	4.672	5.191
58	0.537	1.074	1.611	2.148	2.685	3.222	3.759	4.296	4.833	5.370
59	0.556	1.111	1.666	2.222	2.778	3.333	3.888	4.444	5.000	5.555
60	0.574	1.149	1.724	2.298	2.872	3.447	4.022	4.596	5.170	5.745
61	0.594	1.188	1.782	2.376	2.970	3.565	4.159	4.753	5.347	5.941
62	0.614	1.228	1.843	2.457	3.071	3.685	4.299	4.914	5.528	6.142
63	0.635	1.270	1.905	2.540	3.174	3.809	4.444	5.079	5.714	6.349
64	0.656	1.313	1.969	2.625	3.282	3.938	4.594	5.250	5.907	6.563
65	0.678	1.356	2.035	2.713	3.391	4.069	4.747	5.426	6.104	6.782
66	0.701	1.402	2.103	2.804	3.504	4.205	4.906	5.607	6.308	7.009
67	0.724	1.448	2.172	2.896	3.620	4.345	5.069	5.793	6.517	7.241
68	0.748	1.496	2.244	2.992	3.740	4.488	5.296	5.984	6.732	7.480
69	0.773	1.545	2.318	3.090	3.863	4.636	5.408	6.181	6.953	7.726
70	0.798	1.596	2.394	3.192	3.990	4.788	5.586	6.384	7.182	7.980
71	0.824	1.648	2.472	3.296	4.120	4.944	5.768	6.592	7.416	8.240
72	0.851	1.702	2.552	3.403	4.254	5.105	5.950	6.806	7.657	8.508
73	0.878	1.756	2.635	3.513	4.391	5.269	6.147	7.026	7.904	8.782
74	0.907	1.813	2.720	3.626	4.533	5.440	6.346	7.253	8.159	9.066
75	0.936	1.871	2.807	3.742	4.678	5.614	6.549	7.485	8.430	9.356
76	0.966	1.931	2.896	3.862	4.828	5.793	6.758	7.724	8.690	9.655
77	0.996	1.992	2.989	3.985	4.981	5.977	6.973	7.970	8.966	9.962
78	1.028	2.055	3.083	4.111	5.138	6.166	7.194	8.222	9.249	10.277
79	1.060	2.120	3.180	4.240	5.300	6.361	7.421	8.481	9.541	10.601
80	1.093	2.187	3.280	4.374	5.467	6.560	7.654	8.747	9.841	10.934
81	1.128	2.255	3.382	4.510	5.638	6.765	7.892	9.020	10.148	11.275
82	1.163	2.325	3.488	4.650	5.813	6.976	8.138	9.301	10.463	11.626
83	1.199	2.397	3.596	4.795	5.994	7.192	8.391	9.590	10.788	11.987
84	1.236	2.471	3.707	4.942	6.178	7.414	8.649	9.885	11.120	12.356
85	1.274	2.547	3.821	5.094	6.368	7.642	8.915	10.189	11.462	12.736
86	1.313	2.625	3.938	5.251	6.564	7.877	9.189	10.502	11.814	13.127
87	1.353	2.705	4.058	5.410	6.763	8.116	9.468	10.821	12.173	13.526
88	1.394	2.787	4.181	5.575	6.968	8.362	9.756	11.150	12.543	13.937
89	1.436	2.872	4.308	5.744	7.180	8.615	10.051	11.487	12.923	14.359
90	1.479	2.958	4.437	5.916	7.395	8.874	10.353	11.832	13.311	14.790
91	1.523	3.047	4.570	6.094	7.617	9.140	10.664	12.187	13.711	15.234
92	1.569	3.138	4.707	6.276	7.844	9.413	10.982	12.551	14.120	15.689
93	1.616	3.231	4.846	6.462	8.078	9.693	11.308	12.924	14.540	16.155
94	1.663	3.327	4.990	6.654	8.317	9.980	11.644	13.307	14.971	16.634
95	1.712	3.425	5.137	6.850	8.562	10.274	11.987	13.690	15.412	17.124
96	1.763	3.525	5.288	7.050	8.813	10.576	12.338	14.101	15.863	17.626
97	1.814	3.628	5.443	7.257	9.071	10.885	12.609	14.514	16.328	18.142
98	1.867	3.734	5.601	7.468	9.336	11.203	13.070	14.937	16.804	18.671
99	1.921	3.842	5.764	7.685	9.606	11.527	13.448	15.370	17.291	19.212
100	1.977	3.953	5.930	7.906	9.883	11.860	13.836	15.813	17.789	19.766
101	2.034	4.067	6.100	8.134	10.168	12.201	14.234	16.268	18.302	20.335
102	2.092	4.183	6.275	8.367	10.458	12.550	14.642	16.734	18.825	20.917
103	2.151	4.303	6.454	8.606	10.757	12.908	15.060	17.211	19.363	21.514
104	2.212	4.425	6.638	8.850	11.062	13.275	15.488	17.700	19.912	22.125
105	2.275	4.550	6.825	9.100	11.375	13.650	15.925	18.200	20.475	22.750
106	2.339	4.678	7.018	9.357	11.696	14.035	16.374	18.714	21.053	23.392
107	2.405	4.809	7.214	9.619	12.024	14.429	16.834	19.238	21.643	24.048
108	2.472	4.944	7.416	9.888	12.360	14.832	17.304	19.776	22.248	24.720
109	2.541	5.082	7.622	10.163	12.704	15.245	17.786	20.325	22.867	25.408
+110	2.611	5.222	7.834	10.445	13.056	15.667	18.278	20.890	23.501	26.112

of thermometers, provided with a handle as shown in Fig. 1, which permits the thermometers to be whirled rapidly, the bulbs being thereby strongly affected by the temperature of and moisture in the air. The bulb of the lower of the two thermometers is covered with thin muslin, which is wet at the time an observation is made.



FIG. 1.—Sling psychrometer.

cases it is necessary to continue the whirling until the ice-covered bulb has reached a minimum temperature.

Whirling and stopping the psychrometer.—It is impossible to effectually describe these movements. The arm is held with the forearm about horizontal, and the hand well in front. A peculiar swing starts the thermometers whirling, and afterward the motion is kept up by only a slight but very regular action of the wrist, in harmony with the whirling thermometers. The rate should be a natural one, so as to be easily and regularly maintained. If too fast, or irregular,

The wet bulb.—It is important that the muslin covering for the wet bulb be kept in good condition. The evaporation of the water from the muslin always leaves in its meshes a small quantity of solid material, which sooner or later somewhat stiffens the muslin so that it does not readily take up water. This will be the case if the muslin does not readily become wet after being dipped in water. On this account it is desirable to use as pure water as possible, and also to renew the muslin from time to time. New muslin should always be washed to remove sizing, etc., before being used. A small rectangular piece wide enough to go about one and one-third times around the bulb, and long enough to cover the bulb and that part of the stem below the metal back, is cut out, *thoroughly wet* in clean water, and neatly fitted around the thermometer. It is tied first around the bulb at the top, using a moderately strong thread. A loop of thread to form a knot is next placed around the bottom of the bulb, just where it begins to round off. As this knot is drawn tighter and tighter the thread slips off the rounded end of the bulb and neatly stretches the muslin covering with it, at the same time securing the latter at the bottom.

To make an observation.—The so-called wet bulb is thoroughly saturated with water by dipping it into a small cup or wide-mouthed bottle. The thermometers are then whirled rapidly for fifteen or twenty seconds; stopped and quickly read, the *wet bulb* first. This reading is kept in mind, the psychrometer immediately whirled again and a second reading taken. This is repeated three or four times, or more, if necessary, until at least two successive readings of the wet bulb are found to agree very closely, thereby showing that it has reached its lowest temperature. A minute or more is generally required to secure the correct temperature.

When the air temperature is near the freezing point it very often happens that the temperature of the wet bulb will fall several degrees below freezing point, but the water will still remain in the liquid state. No error results from this, provided the minimum temperature is reached. If, however, as frequently happens, the water suddenly freezes, a large amount of heat is liberated, and the temperature of the wet bulb immediately becomes 32°.

In such

the thermometers may be jerked about in a violent and dangerous manner.

The stopping of the psychrometer, even at the very highest rates, can be perfectly accomplished in a single revolution, when one has learned the knack. This is only acquired by practice, and consists of a quick swing of the forearm by which the hand also describes a circular path, and, as it were, follows after the thermometers in a peculiar manner that wholly overcomes their circular motion without the slightest shock or jerk. The thermometers may, without very great danger, be allowed simply to stop themselves; the final motion in such a case will generally be quite jerky, but, unless the instrument is allowed to fall on the arm, or strikes some object, no injury should result.

Exposure.—While the psychrometer will give quite accurate indications, even in the bright sunshine, yet observations so made are not without some error, and, where greater accuracy is desired, the psychrometer should be whirled in the shade of a building or tree, or, as may sometimes be necessary, under an umbrella. In all cases there should be perfectly free circulation of the air, and the observer should face the wind, whirling the psychrometer in front of his body. It is a good plan, while whirling, to step back and forth a few steps to further prevent the presence of the observer's body from giving rise to erroneous observations.

The relation between the readings of the psychrometer and the pressure of the vapor of water mixed with the air is not perfectly understood, although several empirical formulæ have been developed which express this relation more or less exactly. The tables employed by the Weather Bureau were computed by Professor Ferrel's formula, the constants of which were determined from a large number of comparative observations of the psychrometer and Regnault's dew-point apparatus (see W. B. No. 127). The formula is:

$$p = F - 0.000360 (t - t') (1 + 0.00065 t') P$$

p is the desired pressure of the aqueous vapor.

F is the maximum pressure corresponding to saturation at the temperature of the wet bulb.

t equals the air temperature; t' the wet bulb temperature, and P the barometric pressure.

THE UMBRELLA CLOUD.

By Mr. WILLARD D. JOHNSON.

In the *Meteorologische Zeitschrift* for January, 1896, M. Streit has given an illustration of a remarkable cloud formation, designated as "umbrella cloud," observed in northern Italy. Recently the Editor became aware of an equally interesting formation carefully observed in Kansas and also called an "umbrella cloud" by its discoverer, Mr. Willard D. Johnson, of the U. S. Geological Survey. Mr. Johnson made two sketches of the cloud in his field notebooks and subsequently Mr. DeLancey W. Gill made a more elaborate drawing for him. Reprints of these, by photogravure, are given in the accompanying charts, XI and XII. The Editor deems it important to reproduce the sketches from the field notes, in order that the student may distinguish between those features of the completed drawing that have been filled in from memory and those that have the sketches as a basis. Mr. Johnson writes as follows under date of May 13, 1898:

The date was July 25, 1896. My point of view was 1 mile northwest of Garden City, Kans. The time was about ten minutes of 4 p. m. [? central time]. I was looking nearly due west. The cloud was also observed by Mr. H. W. Menke, of Garden City, a graduate of the University of Kansas. He was about 4 miles to the northwest of my position. He made a photograph with a small pocket camera. As he was not looking toward an illuminated portion of the sky, as I was, the outlines were not so clearly defined. At any rate, his little photograph gives no details; the general outline, however, of the lower truncated cone is plainly distinguishable and agrees very well with the extraordinary form in my sketch.

Mr. Menke, writing from memory, on April 6, 1898, criticises the form of the upper portion of my sketch, a copy of which I had sent to him. He says the overlapping plates appeared to him in rolls increasing in size outward. I think my sketch is to be trusted in this respect, however. The edges of the plates are perhaps too definitely outlined, perhaps also too thin. By combining observations of my own and Mr. Menke I estimate the distance of the cloud in my sketch to be from 8 to 12 miles.

The day had been clear and the windlight. Stormy conditions came on rather abruptly. I regret that I did not notice the beginning of the cloud formation. My attention was called to it by one of my party. I infer that it had but recently formed about where we saw it, otherwise, it seems to me some one of us would have noticed it earlier. I could detect no evidence of a whirling motion, that is, any other than, as you can see, the form itself suggests. I made a memorandum at the time to the effect that appearances seem to indicate that the cloud formed suddenly and had matured just before my attention was called to it. My reason for thinking so was this: The outer edge at the bottom was here and there very sharply outlined, as though it had been entirely symmetrical, and was now breaking up. As I watched it, this departure from symmetry seemed to increase. I recall now, though I did not note it at the time, that the central whirls at the neck, or the smallest portion, were perfectly symmetrical, apparently, and *here* there may have been rapid motion. But if there had been rapid motion at the bottom, at the outer edge of the larger circle, I could have measured it by watching the little defects in the circle.

The whole mass—that is, the broad black cloud, from which the umbrella figure is pendant—was not itself very large, that is, it did not cover more than half of the sky, as I saw it. It was also irregular in outline. The umbrella cloud was pendant from about its center. The sky beyond was brilliant with here and there cumulus clouds. The black and formless character of the cloud mass in general is well indicated in the sketch. I think I have not in the least exaggerated the striking character of the umbrella feature. It was exceedingly remarkable in appearance and excited much local comment. I found but one person who had ever seen such a thing before and he gave it the name that I have used, "umbrella cloud."

The sketch gives, perhaps, too much illumination of the figure. Centrally, at least, it was entirely black, or a very dark green, shading out to a lighter green near the edges. The columns of falling rain, their inclination inward, and the play of lightning were carefully drawn at the time. As to the play of lightning there was none from the umbrella cloud itself to either the mass above or the ground below. It was wholly between the upper cloud and the ground. Sometimes it passed beyond the central mass, sometimes this side, and occasionally entirely through it, as I have indicated.

The direction of travel was toward me and a little to the left, namely, toward a direction a little south of east. The right-hand edge of the suspended cloud passed over me. It appeared to lose its form as it approached, but this was to be expected on account of its size. I regret to say that I did not make note of directions of wind, excepting that the wind shifted rapidly in direction. There was no wind, however, from due south. As to its force, it was rather violent, breaking down a few slender trees, but I did not learn afterwards that at any point there had been anything like a tornado. What had appeared to be rain, however, turned out to be exceptionally heavy hail, sufficiently heavy to kill chickens and two or three young calves. The play of lightning was very rapid. After the cloud had passed, I could discern for a while a slight resemblance to its former appearance, but quite rapidly it lost that character entirely and disappeared on the horizon as an ordinary storm. The weather before and after was not only clear but exceptionally warm.

Mr. H. W. Menke, in his letter dated April 6, 1898, at Aurora, Wyo., says:

I am sorry I can not send a copy from the kodak negative, at least for a long time. I left home soon after making the photograph and have not been in Garden City (Kansas) since, except for a few days' visit.

But I doubt whether the photograph would be of any value to you. If I remember aright details are indistinct, and the print is so small it could hardly be used for reproduction. Your sketch illustrates the characteristic features of the cloud much more clearly than a photograph could have done.

You ask for comments. It is hardly in place for a novice like myself to offer suggestions on the work of a trained observer. Yet, I might mention a few points which appeared different to me.

I was not north of the cloud, as you supposed, but four miles due northwest of Garden City, hence observed the cloud from a very little north of east. I believe you saw it from Garden City.

Of course, our ideas with regard to distance may differ, as we may have made note at different times. At the time my photograph was made the cloud was not over eight miles distant. This is positive because I remember comparing its position with certain landmarks. Assuming this distance (from my point of view) as about correct, I am able to give a very fair estimate of the size of the cloud. This is ob-

tained from my remembrance of the photograph, the relations between the size of image on film, angle of lens, and distance from camera to object. The cloud varied in size, but when photographed it was not less than six miles wide, probably nearer seven than six.

From my point of view, the horns of the inverted funnel were not symmetrical. The cloud was centered in my photograph, but only one horn was included entire on the negative, the other being cut off and, therefore, longer.

Another difference I remember was in the upper part of Mr. Gill's drawing. The flat, shale-like forms which appear in his sketch were much more rounded, i. e., appeared to me like *huge rolls*, increasing in size, of cross sections from center outwards, the outermost several times larger than any of the others.

Also, I do not remember that the layer bounding the lower surface of the inverted funnel and from which rain was falling was so strongly contrasted from the funnel proper. Why not insert a lightning flash shooting from upper disk across lower portion? I saw them frequently.

On this letter Mr. Johnson submits the following remarks elucidating the minor differences between Mr. Menke and himself. He says:

Mr. Menke and I did not sketch the cloud simultaneously. He, however, made a photograph at the time. It was taken with a pocket kodak. It was a snap shot, and obscure. He gave me a copy. I compared it with my sketch but made no changes in the sketch; there was no need. I recently wrote to Mr. Menke asking for another. I will inclose his letter. [See above.] I am sorry I haven't the photograph, but I remember it quite distinctly, and I can say positively that it would merely enable you to make out the outline of the main figure unmistakably, but vaguely.

My estimate as to distance is, I am afraid, pretty rough guess work. I doubt also whether Menke's statement as to this is to be trusted, nor could I now make any estimate as to the height. It seems to me, as I think of it, quite likely that I have overestimated distances and dimensions.

Only one point I wish to emphasize. The structure was in no degree less symmetrical and altogether extraordinary than I have shown it. My sketch was very carefully made, with an effort to exaggerate nothing. [See the reprint of field sketch on Chart No. XI.] In the copy [see Chart No. XII] we have omitted the ranch buildings and trees. The country is a plain, and the cloud form was far beyond the ranch. If my point of view had been a few hundred yards nearer the foreground would have appeared as in the completed drawing. No line has been added to the original sketch, which was made at the time.

I sent Menke one of the photographic copies of Gill's drawing, but without the lightning, which I have since added in Chinese white. You will notice in his letter that he suggests the addition of lightning, from the upper mass to the ground, past the conical structure, as in the original drawing.

VOLUNTARY METEOROLOGICAL AND CROP REPORTING STATIONS.

By F. J. WALZ, Section Director, Weather Bureau, Baltimore, Md.

The general climatic history of the United States is recorded by that branch of governmental service known as the Weather Bureau, which consists of a central controlling station at Washington, D. C., and a number of well-separated regular meteorological stations, about 150 in all; the whole forming a system covering the entire country, each station of which is in swift telegraphic communication with the others and with the Central Office. The work of the Bureau has become familiar to all through its widely distributed publications, such as the daily forecasts and reports of weather and river conditions; the snow and ice charts; and cold wave, frost, and flood warnings; the weekly crop bulletins; the sectional and national monthly reports; and various timely publications of a special nature.

The detailed climatic history of the country, though subordinated to the main purposes of the Bureau, has been provided for in the following manner: One or more States are embraced under the control and supervision of a regular meteorological station, centrally located, to form a section. Points are then selected throughout each section for the location of voluntary stations making a record of temperature and rainfall, and of crop-reporting stations rendering weekly statements on the crops and farming operations during the growing season. At least one voluntary station is established

in each county when possible, and from five to ten crop correspondents generally report from various portions of the same county in a well-organized crop service.

After choosing a suitable location for a voluntary station, the first point to be considered is the selection of an observer, competent and willing to perform the duties. He receives in return for his services the MONTHLY WEATHER REVIEW, issued from the Central Office, and the weekly and monthly publications of the section center, but no salaried compensation. The observer being accepted, he is furnished with a maximum thermometer, minimum thermometer, rain gauge, book of instructions, pad of blank report sheets, and official envelopes. The required knowledge can be mastered in an hour's study. The duties are of a light and agreeable nature, and do not occupy more than ten minutes time each day. They consist of reading and resetting the two thermometers and measuring the rain or snow when any occurs. The results of the observation, that is, the highest and lowest temperatures and the rainfall for the day, are then jotted down on the blank report on the proper date, and the complete report is mailed to the section center at the end of each month.

The work of the crop correspondent is also purely voluntary, and of a still lighter character. He makes a report once a week during the growing season. A supply of official postal cards is furnished, having brief instructions printed at the top, and a blank space beneath for the written report. After giving a plain, concise statement of the week's weather conditions and general crop development, the crop correspondent mails the card so as to reach the section center not later than the following Monday morning. All correspondents receive the weekly and monthly publications issued at their respective section centers.

The Weather Bureau Office at Baltimore, Md., is the headquarters of the section that comprises the States of Maryland and Delaware. The reports from the voluntary stations are mailed to this office; the records of temperature, rainfall, and other atmospheric phenomena are tabulated; the distribution of the temperature and rainfall is charted; a general weather review is prepared; and the entire climatic history of the section is then printed in the monthly publication, which is usually issued within two weeks after the reports are received. The crop correspondents mail their reports so as to reach here by Monday morning; their cards are assorted, examined, and edited Monday afternoon; and the weekly crop bulletin of the section is out by noon of the following day.

The work as briefly outlined above has been continuous in this section since the establishment of the Climate and Crop Service in 1892. During that time the cooperating observers have increased in numbers and efficiency, and in nearly all cases the same observer has acted continuously since the first enlistment of his services, and his interest in the work has apparently advanced with the length of the record obtained. There are now 70 active voluntary stations in this section, and 125 crop correspondents report regularly during the season. The present status of the work is satisfactory in a general sense, but additional observers are needed in a few districts, and the number of crop correspondents must be increased before the entire territory can be said to be thoroughly represented. It is the desire and intention of the section director to make the Maryland and Delaware section of the Climate and Crop Service second to none in the country, and earnest efforts to that end will be vigorously carried on until a perfect service is firmly established.

OBSERVATIONS IN THE KLONDIKE.

By MR. U. G. MYERS, Voluntary Observer, Weather Bureau.

As noted in the MONTHLY WEATHER REVIEW for April, page 154, the Weather Bureau has undertaken to extend its meteorological stations in Alaska. It has also cooperated in

the effort to obtain meteorological information from the Klondike region. To this end, Mr. U. G. Myers, formerly a Weather Bureau observer at New Haven, Conn., has been granted a furlough and is now acting as a voluntary observer. He has been furnished with a proper outfit of instruments. Having occasion to stop at Lake Bennett, on his way to Dawson City, he has secured a record for fifteen days at that place, we make the following extracts from his letter dated June 1, 1898, at Tagish House, N. W. T.:

I have the honor to forward herewith observations of barometer, etc., for sixteen days of May taken at Lake Bennett, Canada (?), at a point on the west shore (opposite the island), longitude 135° west, latitude 60° north (approximately), from Map 3100, U. S. Coast and Geodetic Survey, Juneau to Porcupine River.

The barometer was read at 1 p. m., local time (5 p. m., eastern time). The readings of the "attached thermometer" are also recorded again under "dry," as the barometer was exposed in the open air.

The elevation of Lake Bennett, according to Ogilvie's surveys, is just about 2,200 feet.

Meteorological record at Lake Bennett, Canada.

Date, May, 1898.	Local barom- eter.	Temperature.				Precipitation.			Wind direction.	Weather.	Snow on ground.
		1 p. m.	Max.	Min.	Mean.	Began.	Ended.	Amount.			
9.....	27.310	47.5	54.9	31.0	43.3			0.00	S.	Partly cl'dy.	T.
10.....	.407	40.0	43.0	32.0	38.3			0.00	S.	Clear.	T.
11.....	.846	42.0	44.5	27.9	38.3			0.00	S.	Clear.	T.
12.....	.632	52.0	52.6	31.0	45.2			0.00	S.	Clear.	T.
13.....	.472	54.0	55.6	34.1	45.9			0.00	S.	Partly cl'dy.	T.
14.....	.473	54.0	54.0	25.2	44.4			0.00	S.	Partly cl'dy.	T.
15.....	.574	47.0	54.6	40.0	47.2	5:30 a. m.	6 a. m.	0.00	S.	Partly cl'dy.	T.
16.....	.475	55.0	57.0	44.0	52.0			0.00	S.	Cloudy.	T.
17.....	.369	46.0	50.0	37.1	44.4			0.00	S.	Partly cl'dy.	T.
18.....	.373	50.0	52.6	31.0	44.4			0.00	S.	Clear.	T.
19.....	.317	52.0	54.1	27.1	44.4			0.00	S.	Clear.	T.
20.....	.314	47.5	49.0	27.2	38.3	D. N.	10 a. m.	0.00	S.	Partly cl'dy.	T.
21.....	.237	52.0	57.0	29.2	43.3			0.00	S.	Partly cl'dy.	T.
22.....	.467	52.0	58.0	27.5	43.3			0.00	S.	Clear.	T.
23.....	.650	52.0	63.5	26.8	46.6	D. N.	7 a. m.	0.10	S.	Clear.	T.
24.....	.724	59.0	61.4	38.0	50.0			0.00	S.	Cloudy.	T.
Sums.....								0.10			
Means.....	27.485	50.1	54.5	31.8	43.1				S.		T.

D. N.—During the night.

The snow on ground since I have been here consists of that on the mountains and heavy drifts in the timber, though the latter have about disappeared at this time, May 24.

The precipitation recorded is what occurred on the immediate lake shore, no record being made of the frequent snowstorms on the mountains. The mountains rise abruptly some 2,000 feet high above the lakes. Mosquitoes first appeared on May 2.

[The daily record of the mercurial barometer, as given in the original record, has been corrected for temperature of the attached thermometer, thereby giving the so-called "local barometric height," but has not been converted into standard local pressure by adding the reduction to standard gravity; the latter reduction for latitude 60° and pressure 27.4 inches is plus 0.036, so that the above mean local pressure becomes 27.521, subject to a slight uncertainty depending on the diminution of gravity with altitude. The reduction to sea level, according to Mr. Morrill's method of using the international tables, gives 29.805 for the barometric height, or 29.84 for the standard pressure, which latter agrees exactly with the normal values on the map for May in Buchan's volume of the reports of the Challenger Expedition. In this calculation an altitude of 2,200 feet has been assumed in accordance with Mr. Myers' quotation from Ogilvie's Surveys. One would be tempted to reverse the computation and redetermine the altitude of Bennett Lake if we had corresponding observations at any well established neighboring station.—Ed.]

CLIMATOLOGICAL DATA FOR JAMAICA, W. I.

Through the kindness of Mr. Maxwell Hall, of Montego Bay, Jamaica, the meteorological service of that colony communicates an abstract of the very interesting climatological records of that highly important West Indian service. The climatological summary furnished by Mr. Hall, through his assistant, Mr. Robert Johnstone, of the Meteorological Office, is reproduced in the following table. For descriptive details of the stations and instruments see Vol. XXV, pages 308 and 356.

Montego Bay, where Mr. Maxwell Hall resides, is between 4 and 5 miles west, and also the same distance north of Kempshot Observatory. The location of the latter is N. 18° 24' 50", W. 77° 52' 22". Stony Hill Reformatory is about 8 miles north of Kingston and within a mile to the west. Hope Gardens is between 3 and 4 miles to the north of Kingston, and about the same distance to the east. From these measurements the latitudes and longitudes given in the following table have been deduced:

Climatological data for Jamaica, W. I.
MARCH, 1898.

	Morant Point Lighthouse.	Negril Point Lighthouse.	Kingston.	Montego Bay.	Castleton Gar- dens.	Hope Gardens.	Stony Hill Re- formatory.	Hill Gardens. (Ch. Planet.)
Latitude.....	17° 56'	18° 16'	17° 58'	18° 30'	18° 12'	18° 02'	18° 06'	18° 05'
Longitude.....	76° 10'	76° 33'	76° 48'	77° 57'	76° 50'	76° 46'	76° 40'	76° 39'
Elevation (feet).....	8	33	50	160	580	600	1,400	4,907
Mean barometer { 7 a. m.	29.947	29.964	29.962	29.961	.....	.....	.....	.....
{ 3 p. m.	29.912	29.900	29.892	29.896	.....	.....	.....	.....
Mean temperature { 7 a. m.	73.6	69.7	70.3	66.6	67.1	67.0	55.7	.....
{ 3 p. m.	82.8	83.7	80.7	79.6	82.6	77.6	63.4	.....
Mean of maxima.....	85.3	85.7	82.4	82.4	86.0	82.1	67.1	.....
Mean of minima.....	69.0	67.4	67.2	63.6	62.3	63.1	52.8	.....
Highest maximum.....	90	89.6	87.0	87	88	85	71	.....
Lowest minimum.....	64	64.0	62.9	56	59	60	56	.....
Mean dew-point { 7 a. m.	68.1	63.5	65.1	64.2	61.7	62.5	51.4	.....
{ 3 p. m.	70.7	66.0	64.6	70.0	67.0	74.7	57.4	.....
Mean relative humidity { 7 a. m.	83	81	84	89	84	86	85	.....
{ 3 p. m.	67	56	58	70	58	91	80	.....
Monthly rainfall (inches).....	0.23	0.09	1.31	0.56	2.37	0.66	2.60	2.08
Average daily wind movement.....	261.0	41.7	110.3	.....	.....	.....	61.4	.....
Average wind direction { 7 a. m.	nne.	n. by e.	n.	ene.	.....	.....	e.	.....
{ 3 p. m.	* var.	se. by s.	ne.	.....	.....	.....	e.	.....
Average hourly velocity { 7 a. m.	11	10.6	1.5	2.6	.....	.....	.....	.....
{ 3 p. m.	12	16.5	4.2	9.6	.....	.....	.....	.....
Average cloudiness (tenths):								
7 a. m. { Lower clouds.....	2.5	1.7	0.6	0.7	.....	.....	.....	.....
{ Middle clouds.....	1.8	1.2	0.7	1.4	.....	.....	.....	.....
{ Upper clouds.....	0.8	0.3	0.6	0.7	.....	.....	.....	.....
3 p. m. { Lower clouds.....	2.6	2.8	0.7	0.0	.....	.....	.....	.....
{ Middle clouds.....	1.5	2.2	1.3	2.2	.....	.....	.....	.....
{ Upper clouds.....	0.7	0.7	2.1	0.6	.....	.....	.....	.....

* ne. by n.

APRIL, 1898.

Mean barometer { 7 a. m.	29.976	29.975	29.967	29.975	.....	.....	.....	.....
{ 3 p. m.	29.925	29.930	29.932	29.916	.....	.....	.....	.....
Mean temperature { 7 a. m.	76.8	72.9	72.5	69.1	70.7	68.7	59.1	.....
{ 3 p. m.	81.2	82.7	83.0	82.2	82.8	78.3	64.1	.....
Mean of maxima.....	84.4	85.9	85.5	86.4	82.9	83.4	67.2	.....
Mean of minima.....	71.2	69.7	68.4	63.2	64.0	64.6	54.8	.....
Highest maximum.....	88	88.9	90.7	91	91	87	72	.....
Lowest minimum.....	68	67.3	64.3	58	61	61	50	.....
Mean dew-point { 7 a. m.	72.4	66.0	67.9	65.7	62.7	65.5	54.5	.....
{ 3 p. m.	73.6	68.5	69.3	77.2	68.1	74.1	59.3	.....
Mean relative humidity { 7 a. m.	86	79	85	89	75	90	83	.....
{ 3 p. m.	79	62	65	81	60	87	84	.....
Monthly rainfall (inches).....	1.36	3.84	0.17	1.23	7.47	1.07	5.32	4.25
Average daily wind movement.....	205.9	49.5	71.3	.....	.....	.....	13.0	.....
Average wind direction { 7 a. m.	*	*	n.	ene.	.....	.....	e.	.....
{ 3 p. m.	ene.	var.	se.	ne.	.....	.....	se.	.....
Average hourly velocity { 7 a. m.	4.7	6.3	0.9	1.7	.....	.....	.....	.....
{ 3 p. m.	5.9	9.3	6.0	6.9	.....	.....	.....	.....
Average cloudiness (tenths):								
7 a. m. { Lower clouds.....	3.0	1.2	0.7	0.4	.....	.....	.....	.....
{ Middle clouds.....	1.6	2.2	0.9	1.1	.....	.....	.....	.....
{ Upper clouds.....	0.9	2.3	2.0	1.8	.....	.....	.....	.....
3 p. m. { Lower clouds.....	2.8	5.0	3.2	0.4	.....	.....	.....	.....
{ Middle clouds.....	1.8	3.2	1.2	5.3	.....	.....	.....	.....
{ Upper clouds.....	0.9	0.5	3.2	0.0	.....	.....	.....	.....

* ne. by e.

Climatological data for Jamaica—Continued.

MAY, 1898.

	Morant Point Lighthouse.	Negril Point Lighthouse.	Kingston.	Montego Bay.	Castleton Gar- dens.	Hope Gardens.	Stony Hill Re- formatory.	Hill Gardens. (Ch. Planet.)
Mean barometer { 7 a. m.	29.914	29.910	29.917	29.900	29.900	.....	.....	29.903
{ 3 p. m.	29.867	29.873	29.867	29.852	29.853	.....	.....	29.176
Mean temperature { 7 a. m.	78.2	77.1	75.4	73.1	74.2	71.7	61.4	.....
{ 3 p. m.	83.1	83.6	83.0	81.6	82.0	77.0	65.0	.....
Mean of maxima.....	86.1	86.0	85.8	83.8	86.6	82.6	68.2	.....
Mean of minima.....	73.0	72.4	70.7	66.3	67.9	66.8	57.5	.....
Highest maximum.....	88.8	89.1	89.9	90	93	87	72	.....
Lowest minimum.....	67.9	65.9	65.9	63	59	65	55	.....
Mean dew-point { 7 a. m.	71.7	70.7	70.8	69.4	69.0	69.3	57.0	.....
{ 3 p. m.	73.0	71.8	73.1	73.8	71.4	73.6	62.0	.....
Mean relative humidity { 7 a. m.	81	81	86	86	84	92	80	.....
{ 3 p. m.	72	69	72	78	69	89	85	.....
Monthly rainfall (inches).....	15.93	10.39	9.66	13.56	23.60	15.74	21.21	44.31
Average daily wind movement.....	242.3	43.4	55.1	.....	.....	.....	23.5	.....
Average wind direction { 7 a. m.	ene.	ne.	n.	.....	.....	.....	e.	.....
{ 3 p. m.	* var.	se.	n.	.....	.....	.....	se.	.....
Average hourly velocity { 7 a. m.	5.2	9.5	1.0	2.2	.....	.....	.....	.....
{ 3 p. m.	7.2	13.7	5.3	5.4	.....	.....	.....	.....
Average cloudiness (tenths):								
7 a. m. { Lower clouds.....	3.5	1.7	0.9	1.2	.....	.....	.....	.....
{ Middle clouds.....	1.9	2.2	0.8	0.1	.....	.....	.....	.....
{ Upper clouds.....	1.1	2.5	2.2	4.4	.....	.....	.....	.....
3 p. m. { Lower clouds.....	3.7	3.5	3.2	1.1	.....	.....	.....	.....
{ Middle clouds.....	1.6	4.2	1.6	5.7	.....	.....	.....	.....
{ Upper clouds.....	0.9	1.0	1.9	1.2	.....	.....	.....	.....

* ne. by e.

MEXICAN CLIMATOLOGICAL DATA.

Through the kind cooperation of Señor Mariano Bárcena, Director, and Señor José Zendejas, vice-director, of the Central Meteorológico-Magnetic Observatory, the monthly summaries of Mexican data are now communicated in manuscript, in advance of their publication in the *Boletín Mensual*; an abstract translated into English measures is here given in continuation of the similar tables published in the MONTHLY WEATHER REVIEW since 1896. The barometric means have not been reduced to standard gravity, but this correction will be given at some future date when the pressures are published on our Chart IV.

Mexican data for May, 1898.

Stations.	Altitude.	Mean barometer.	Temperature.			Relative humidity.	Precipitation.	Prevailing direction.	
			Max.	Min.	Mean.			Wind.	Cloud.
Durango (Seminario)	6,243	24.00	92.7	52.9	72.1	24	0.65	ws.	w.
Leon (Guanajuato)	5,934	24.25	92.7	52.9	73.6	37	1.06	ws.	ne. w.
Magdalena (Sonora)	2,618	.....	.....	.....	76.6	.....	.....	sw.	n.
Mazatlan	25	29.89	83.8	66.9	75.9	80	0.06	nw.	sw.
Merida (Yucatan)	50	29.86	101.3	65.8	83.3	63	2.67	e.	se.
Mexico (Obs. Cent.)	7,472	23.04	84.0	50.0	65.8	47	0.69	nw.	sw.
Morelia (Seminario)	6,401	23.94	87.8	53.6	70.5	51	0.85	ws.	nw.
Oaxaca	5,164	25.06	94.1	51.1	75.6	54	1.18	s.	e.
Puebla (Col. Cat.)	7,112	23.32	83.5	41.2	67.1	59	3.19	e.	e.
San Luis Potosi	6,202	24.08	93.4	53.4	72.0	48	0.44	e.	w.
Toluca	8,612	21.98	75.0	40.1	59.7	56	1.07	nw.	.....
Tuxtla G. (Chiapas)	1,864	28.07	100.2	64.4	75.7	61	3.16	nw.	.....
Tuxpan (Vera Cruz)	.....	30.17	98.6	64.9	85.6	77	1.81	e.	s.
Zapotlan (Seminario)	5,078	.....	93.0	55.2	76.5	41	0.14	sse.	w.
Zacatecas	8,015	22.47	86.0	46.4	66.4	37	0.29	sw.	sw.

OBSERVATIONS AT RIVAS, NICARAGUA.

The records contributed for many years by Dr. Earl Flint, at Rivas, Nicaragua, include barometric readings. His present station is at 11° 26' N., 85° 47' W. The observations at 7:17 a. m., local time are simultaneous with Greenwich 1 p. m. The altitude of his barometer is 36 meters above sea level, but until the barometer has been compared with a standard it seems hardly necessary to publish the daily readings. The wind force is recorded on the Beaufort scale, 0-12. When cloudiness is less than $\frac{1}{10}$, the letter "F," or "Few," is recorded.

On his forms for December Mr. Flint states that the total annual rainfall for 1897 was 123.43 inches, or the greatest during the eighteen years of his observations.

His station is situated on the western shore of Lake Nicaragua, not far from the eastern end of the western division of the Nicaragua Canal. The volcano Ometepe, on an island in Lake Nicaragua, is about 10 miles northeast of his station. Mr. Flint's records occasionally mention the presence of clouds in the early morning on the summit of this mountain.

Observations at Rivas, Nicaragua, April, 1898.

OBSERVATIONS AT 7 A. M.

Date.	Temperature.		Wind.	Upper clouds.			Lower clouds.			Daily rainfall.
	Alr.	Dew-point.		Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.	
1.....	76.5	69	ne.	cs.	3	sw.	ks.	Few	ne.	0.00
2.....	76	70	ne.	c.	2	sw.	ks.	1	ne.	0.00
3.....	76	72	ne.	2-4	0	sw.	ks.	Few	ne.	0.00
4.....	77	70	ne.	1	0	sw.	ks.	3	ne.	0.00
5.....	77	72	ne.	1	0	sw.	ks.	8	ne.	0.00
6.....	77.5	74	ne.	1	0	sw.	ks.	1	ne.	0.00
7.....	77	72	ne.	1	0	sw.	ks.	0	ne.	0.00
8.....	77	68	ne.	2	0	sw.	ks.	0	ne.	0.00
9.....	77	70	ne.	2	0	sw.	ks.	0	ne.	0.00
10.....	77	70	ne.	2	0	sw.	ks.	0	ne.	0.00
11.....	78	70	ne.	2	0	sw.	ks.	0	ne.	0.00
12.....	78	72	ne.	2	0	sw.	ks.	0	ne.	0.00
13.....	77	71	ne.	1	0	sw.	ks.	0	ne.	0.00
14.....	77	70	ne.	1	0	sw.	ks.	0	ne.	0.00
15.....	77	70	ne.	0	0	sw.	ks.	0	ne.	0.00
16.....	77	70	ne.	1	0	sw.	ks.	0	ne.	0.00
17.....	77.5	72	ne.	1	0	sw.	ks.	0	ne.	0.00
18.....	78	72	ne.	1	0	sw.	ks.	0	ne.	0.00
19.....	77.5	70	ne.	1	0	sw.	ks.	0	ne.	0.00
20.....	77.5	71	ne.	1	0	sw.	ks.	0	ne.	0.00
21.....	78	72	ne.	1	0	sw.	ks.	0	ne.	0.00
22.....	77.5	70	ne.	1	0	sw.	ks.	0	ne.	0.00
23.....	77	72	ne.	1	0	sw.	ks.	0	ne.	0.00
24.....	78	72	ne.	1	0	sw.	ks.	0	ne.	0.00
25.....	78	71	ne.	1	0	sw.	ks.	0	ne.	0.00
26.....	78	71	ne.	1	0	sw.	ks.	0	ne.	0.00
27.....	78	68	ne.	1	0	sw.	ks.	0	ne.	0.00
28.....	77.5	70	ne.	1	0	sw.	ks.	0	ne.	0.00
29.....	79	72	ne.	1	0	sw.	ks.	0	ne.	0.00
30.....	79	71	ne.	2	0	sw.	ks.	0	ne.	0.00
Means ..										0.00

OBSERVATIONS AT 8 P. M.

Date.	Temperature.		Wind.	Upper clouds.			Lower clouds.			Daily rainfall.
	Alr.	Dew-point.		Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.	
1.....	79	72	ne.	2	0	sw.	ck.	2	ne.	0.00
2.....	80	73	ne.	2	0	sw.	ck.	0	ne.	0.00
3.....	80	73	ne.	1	0	sw.	ck.	10	ne.	0.00
4.....	80	74	ne.	1	0	sw.	ck.	10	ne.	0.00
5.....	79	73	ne.	1	0	sw.	ck.	10	ne.	0.00
6.....	80	73	ne.	1	0	sw.	ck.	10	ne.	0.00
7.....	79	72	ne.	1	0	sw.	ck.	10	ne.	0.00
8.....	79	72	ne.	2	0	sw.	ck.	10	ne.	0.00
9.....	79	72	ne.	1	0	sw.	ck.	10	ne.	0.00
10.....	80	72	ne.	2	0	sw.	ck.	10	ne.	0.00
11.....	81	73	ne.	1	0	sw.	ck.	10	ne.	0.00
12.....	80	72	ne.	2	0	sw.	ck.	10	ne.	0.00
13.....	81	73	ne.	0	0	sw.	ck.	10	ne.	0.00
14.....	80.5	73	ne.	1	0	sw.	ck.	10	ne.	0.00
15.....	81	73	ne.	2	0	sw.	ck.	10	ne.	0.00
16.....	82	74	ne.	1	0	sw.	ck.	10	ne.	0.00
17.....	80	74	ne.	1	0	sw.	ck.	10	ne.	0.00
18.....	81	74	ne.	1	0	sw.	ck.	10	ne.	0.00
19.....	81	76	ne.	2	0	sw.	ck.	10	ne.	0.00
20.....	81	73	ne.	1	0	sw.	ck.	10	ne.	0.00
21.....	81	74	ne.	2	0	sw.	ck.	10	ne.	0.00
22.....	80	73	ne.	1	0	sw.	ck.	10	ne.	0.00
23.....	80	74	ne.	0	0	sw.	ck.	10	ne.	0.00
24.....	81	74	ne.	1	0	sw.	ck.	10	ne.	0.00
25.....	82	72	ne.	1	0	sw.	ck.	10	ne.	0.00
26.....	80	72	ne.	2	0	sw.	ck.	10	ne.	0.00
27.....	80	73	ne.	2	0	sw.	ck.	10	ne.	0.00
28.....	81	73	ne.	2	0	sw.	ck.	10	ne.	0.00
29.....	82	72	ne.	1	0	sw.	ck.	10	ne.	0.00
30.....	82	75	ne.	1	0	sw.	ck.	10	ne.	0.00
Means.....	80.3									0.00

* These clouds are over Ometepe. † Sprinkle 34th, 7:30 p. m.

REV—3

Observations at Rivas, Nicaragua, May, 1898.

OBSERVATIONS AT 7 A. M.

Date.	Temperature.		Wind.	Upper clouds.			Lower clouds.			Daily rainfall.
	Alr.	Dew-point.		Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.	
1.....	79	73	ne.	1	0	sw.	ks.	7	ne.	0.00
2.....	80	73	ne.	2	0	sw.	ks.	6	ne.	0.00
3.....	79	75	ne.	2	0	sw.	ks.	1	ne.	0.00
4.....	79	72	ne.	2	0	sw.	ks.	1	ne.	0.00
5.....	79	75	ne.	1	0	sw.	ks.	0	ne.	0.00
6.....	79	75	ne.	0	0	sw.	ks.	10	ne.	0.12
7.....	80	74	ne.	1	0	sw.	ks.	0	ne.	0.00
8.....	81	76	ne.	1	0	sw.	ks.	1	ne.	0.00
9.....	80.5	76	ne.	1	0	sw.	ks.	10	ne.	0.00
10.....	80	73	ne.	1	0	sw.	ks.	Few	ne.	0.00
11.....	81	76	ne.	1	0	sw.	ks.	Few	ne.	0.11
12.....	80	74	ne.	1	0	sw.	ks.	9	ne.	0.00
13.....	80	75	ne.	2	0	sw.	ks.	Few	ne.	0.00
14.....	79	72	ne.	1	0	sw.	ks.	0	ne.	0.00
15.....	78	74	ne.	0	0	sw.	ks.	0	ne.	0.60
16.....	79	75	ne.	2	0	sw.	ks.	0	ne.	0.00
17.....	78	72	ne.	0	0	sw.	ks.	0	ne.	0.00
18.....	77	74	ne.	0	0	sw.	ks.	10	ne.	0.20
19.....	77	74	ne.	0	0	sw.	ks.	0	ne.	3.15
20.....	76	73	ne.	0	0	sw.	ks.	0	ne.	1.30
21.....	76.5	73	ne.	0	0	sw.	ks.	0	ne.	0.00
22.....	79	73	ne.	0	0	sw.	ks.	10	ne.	2.83
23.....	79	74	ne.	0	0	sw.	ks.	10	ne.	4.87
24.....	78	73	ne.	1	0	sw.	ks.	10	ne.	0.79
25.....	77	73	ne.	0	0	sw.	ks.	10	ne.	0.90
26.....	77	74	ne.	0	0	sw.	ks.	10	ne.	0.20
27.....	77	74	ne.	0	0	sw.	ks.	2	sw.	0.00
28.....	77	74	ne.	0	0	sw.	ks.	0	sw.	1.07
29.....	77	74	ne.	0	0	sw.	ks.	0	sw.	0.00
30.....	78	75	ne.	0	0	sw.	ks.	0	sw.	0.79
31.....	78	74	ne.	0	0	sw.	ks.	10	ne.	0.00
Means ..	78									16.17

OBSERVATIONS AT 8 P. M.

Date.	Temperature.		Wind.	Upper clouds.			Lower clouds.			Daily rainfall.
	Alr.	Dew-point.		Kind.	Amount.	Direction from.	Kind.	Amount.	Direction from.	
1.....	82	75	ne.	2	0	sw.	ks.	10	ne.	0.00
2.....	82	74	ne.	1	0	sw.	ks.	10	ne.	0.00
3.....	83	75	ne.	1	0	sw.	ks.	10	ne.	0.00
4.....	81	74	ne.	2	0	sw.	ks.	10	ne.	0.00
5.....	81	76	ne.	1	0	sw.	ks.	10	ne.	0.00
6.....	83	76	ne.	2	0	sw.	ks.	10	ne.	0.00
7.....	85	78	ne.	1	0	sw.	ks.	10	ne.	0.00
8.....	85	78	ne.	1	0	sw.	ks.	10	ne.	0.00
9.....	84	76	ne.	0	0	sw.	ks.	10	ne.	0.00
10.....	83	75	ne.	1	0	sw.	ks.	10	ne.	0.00
11.....	80	76	ne.	2	0	sw.	ks.	10	ne.	0.00
12.....	84	76	ne.	2	0	sw.	ks.	10	ne.	0.00
13.....	83	74	ne.	2	0	sw.	ks.	10	ne.	0.00
14.....	83	75	ne.	0	0	sw.	ks.	10	ne.	0.00
15.....	79	75	ne.	3	0	sw.	ks.	10	ne.	0.00
16.....	80	73	ne.	0	0	sw.	ks.	10	ne.	0.00
17.....	82	75	ne.	0	0	sw.	ks.	10	ne.	0.00
18.....	81	76	ne.	1	0	sw.	ks.	10	ne.	0.00
19.....	78	75	ne.	0	0	sw.	ks.	10	ne.	0.00
20.....	77	73	ne.	0	0	sw.	ks.	10	ne.	0.00
21.....	77	74	ne.	1	0	sw.	ks.	10	ne.	0.00
22.....	75	74	ne.	0	0	sw.	ks.	10	ne.	0.00
23.....	76	73	ne.	1	0	sw.	ks.	10	ne.	0.00
24.....	77	73	ne.	2	0	sw.	ks.	10	ne.	0.00
25.....	77	73	ne.	0	0	sw.	ks.	10	ne.	0.00
26.....	78	75	ne.	1	0	sw.	ks.	10	ne.	0.00
27.....	79	76	ne.	1	0	sw.	ks.	10	ne.	0.00
28.....	78.5	75	ne.	0	0	sw.	ks.	10	ne.	0.00
29.....	78	77	ne.	0	0	sw.	ks.	10	ne.	0.00
30.....	78	77	ne.	0	0	sw.	ks.	10	ne.	0.00
31.....	82	75	ne.	2	0	sw.	ks.	10	ne.	0.00
Means ..	80									0.00

A note by Mr. Flint, in connection with this report, says:

Again I repeat my suspicion of August 7 that my barometer has fallen slightly; it is simply a cup with tube inserted, surrounded with loose cotton to prevent dust, and is only reliable for range of pressure; the variation has seldom exceeded 0.1 inch.

In a previous paper May 19, 1896, Mr. Flint had stated:

I made my barometer myself; purified the mercury, heated it and the tube; worked the air bubbles out with a wire; placed the tube in a grooved slot; kept it in the sun for some days; capped the end when

the mercury completely filled it; placed a cup over the cap and inverted the tube and placed it in a permanent position; it is observed for monthly maximum and minimum and monthly range. Made several trips to the ocean steamers, comparing the mean range with first-class aneroid. Mr. Chamberlain, at the same time, leveled over the railroad to my office; resulting altitude 99 feet, and adding 3 for the height of the cistern gives 102 feet above the level of the lake. The latter level varies; the canal company assigns 105 feet, but they measured in the dry season; 210 feet is the approximate altitude of my barometer cistern above sea level. On the 18th of May, 1896, the lake was 8.5 feet below the high water of 1895. I formerly used 200 feet as the altitude, but will adopt your correction and, thereby, obtain the sea-level pressure of 29.80 for May 19, 1896. The local pressure on May 16 was exactly normal, according to my scale; for the first fourteen days of the month it was below normal and unusual. In April it was above normal. The range during the month rarely exceeds 0.11. My former observations were made at Granada and were sent to the Smithsonian Institution. The barometer at Granada College is about 180 feet above sea level, but the reported readings are not corrected for this. Until lately I was the only one who measured rainfall in this region.

OBSERVATIONS AT HONOLULU, REPUBLIC OF HAWAII.

Through the kind cooperation of Mr. Curtis J. Lyons, Meteorologist to the Government Survey, a copy of the daily record at Honolulu is communicated to the Weather Bureau in advance of its official publication, and is herewith printed, as a special contribution, for the convenience of those who are studying the relations of the storms and weather of the United States to those of adjacent countries, with a view to long-range, seasonal predictions.

Meteorological observations at Honolulu, Republic of Hawaii.

MAY, 1898.

May, 1898.	Pressure at sea level.			Temperature.					Relative humidity.			Wind.*		Rain measured at 6 a. m.	
	7 a. m.	3 p. m.	9 p. m.	6 a. m.	3 p. m.	9 p. m.	Maximum.	Minimum.	7 a. m.	3 p. m.	9 p. m.	Direction.	Force.		Cloudiness.
1	30.04	30.00	30.07	64	77	79	81	63	78	65	77	nne.	2	4	0.00
2	30.09	30.04	30.12	67	76	79	79	65	73	66	82	nne.	3	5	0.00
3	30.11	30.04	30.12	70	78	73	79	68	80	63	74	ene.	4	7	0.08
4	30.10	30.08	30.09	72	77	73	79	71	70	65	74	ene.	3	9	0.05
5	30.05	30.02	30.10	72	77	72	78	71	74	61	77	ene.	4	9	0.01
6	30.06	30.00	30.10	71	78	73	79	69	82	59	70	ene-ne.	2-4	9-3	0.17
7	30.11	30.07	30.15	73	78	71	79	71	74	63	77	ne.	4	4	0.01
8	30.11	30.05	30.10	70	78	72	79	69	...	53	69	nne.	3	3	0.03
9	30.08	30.02	30.08	70	75	73	78	68	81	70	68	ne.	4	5	0.08
10	30.08	30.00	30.10	71	77	72	80	70	70	56	73	nne.	4	3-1	0.09
11	30.12	30.07	30.14	70	76	73	78	68	73	60	70	ne.	4	4	0.09
12	30.19	30.15	30.19	71	77	72	79	70	81	60	69	ne.	4	3-7	0.05
13	30.15	30.07	30.12	71	77	71	79	69	...	56	69	ne.	4-5	3-1	0.00
14	30.08	30.00	30.06	70	78	70	79	69	...	53	73	ne.	3-0	3-1	0.00
15	30.02	30.00	30.08	67	78	71	79	63	...	56	77	ne-n.	3	5-3	0.06
16	30.10	30.08	30.15	70	77	73	78	62	...	63	74	ne.	3	8-3	0.20
17	30.16	30.16	30.22	71	76	74	77	71	73	68	74	ene.	3-5	10	0.24
18	30.11	30.08	30.13	72	77	74	79	72	73	63	76	nne-n.	6-4	9	0.01
19	30.15	30.11	30.15	72	77	73	77	72	67	63	74	ene-n.	4-5	10-5	0.00
20	30.15	30.13	30.19	71	75	73	79	68	72	68	74	nne.	3-4	8-10	0.02
21	30.17	30.16	30.21	71	75	73	77	71	66	66	67	ene.	3-4	7-10	0.00
22	30.11	30.10	30.14	71	78	73	79	70	66	58	69	ne.	3-2	5-10	0.00
23	30.11	30.06	30.13	69	79	72	81	68	67	53	77	ne.	1	1	0.00
24	30.10	30.05	30.13	71	79	73	81	69	74	58	74	ne.	2	5	0.00
25	30.12	30.09	30.15	68	77	72	80	67	86	67	80	ne.	3	6	0.08
26	30.15	30.10	30.15	69	76	74	80	68	77	70	77	ne.	3	5	0.12
27	30.14	30.06	30.13	71	79	74	81	67	70	60	74	ne.	3	3-5	0.00
28	30.12	30.09	30.15	70	79	74	80	69	80	60	70	ne.	3	5	0.06
29	30.15	30.13	30.18	71	79	74	80	70	86	60	74	ne.	4	5	0.04
30	30.16	30.13	30.16	72	79	74	80	70	77	64	74	ne.	4	6	0.07
31	30.15	30.04	30.07	72	78	73	80	70	70	64	75	ne.	3	5	0.04
	30.11	30.07	30.13	70.6	77.3	72.5	79.2	68.8	...	61.6	73.6	.....	.....	.....	1.35

The station is at 21° 18' N., 157° 50' W.; altitude 50 feet.
Pressure is corrected for temperature and reduced to sea level, but the gravity correction, -0.06, is still to be applied.
The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the

extremes are given. The scale of wind force is 0 to 10. Two directions of wind, or values of wind force, connected by a dash, indicate change from one to the other.
The rainfall for twenty-four hours is given as measured at 6 a. m. on the respective dates.

* Average wind for the day.

This record for May is signed by Emma C. Lyons.

OBSERVATIONS AT PORT AU PRINCE, HAITI.

Through the kind cooperation of Prof. T. Scherer of Port au Prince, Haiti, the meteorological observations taken by him at 7 a. m., local time, or 11:49 a. m., Greenwich time, are communicated in manuscript for early publication in the MONTHLY WEATHER REVIEW. By entering these on the monthly and annual charts, published by the Weather Bureau, we obtain an important extension southeastward of our field of study. The observations are taken 1^h 11^m earlier than those of the Weather Bureau telegraph system. The original reports are in metric measures; the conversions are by the Editor.

The barometer is 119 feet above sea level; its readings have been corrected by Professor Scherer for temperature and elevation, but not for gravity, this latter correction is -0.064 inch; the thermometers are 6.7 feet above ground; the rain gauge, 7.2 feet above ground. The wind velocity is given in miles per hour.

The position of Port au Prince, Haiti, is latitude 18° 34' N., longitude 72° 21' W., or 4^h 49^m west of Greenwich. Additional records for this station are published in the annual volume of the Central Meteorological Institute at Vienna.

Observations at Port au Prince, Haiti.

MAY, 1898.

Date.	Barometer reduced.	Temperature.		Rel. humidity.	Wind.		Clouds.		Preceding 24 hours.	
		Alt.	Dew-point.		Direction.	Velocity.	Kind.	Amount.	Direction.	Total rain.
	Inches	°	°	%						Inches
1.....	30.05	77.2	68.4	76	e.	7	k	9	.....	0.25
2.....	30.04	78.4	66.0	67	ese.	7	.....	0	.....	0.12
3.....	30.04	76.5	67.5	75	.....	0	k	1	wsw.	0.00
4.....	30.01	77.0	68.2	76	e.	4	s	1	e.	0.00
5.....	30.02	77.0	68.2	76	e.	2	.....	0	.....	0.00
6.....	30.04	77.0	63.5	65	e.	11	.....	0	.....	0.25
7.....	30.02	76.1	65.8	72	e.	7	.....	0	.....	0.00
8.....	29.98	77.9	69.3	76	e.	2	ck	1	.....	0.00
9.....	29.95	81.3	69.4	69	ese.	11	s	2	e.	0.00
10.....	30.00	80.6	70.9	74	e.	11	cs	1	.....	0.00
11.....	30.02	79.3	67.3	68	e.	7	s	1	.....	0.00
12.....	30.00	80.6	64.0	59	e.	11	sk	1	sw.	0.00
13.....	30.00	79.9	59.9	52	e.	9	.....	0	.....	2.34
14.....	29.94	79.0	70.9	78	ese.	7	.....	1	.....	0.15
15.....	30.03	79.2	69.1	72	e.	7	.....	0	.....	0.02
16.....	30.10	78.1	67.1	70	e.	2	ck	4	.....	0.38
17.....	30.08	74.3	66.9	79	e.	2	e	10	w.	1.12
18.....	30.03	74.1	71.8	93	.....	0	ck; k	9	w.	0.00
19.....	30.04	76.5	70.2	82	e.	4	ck	7	.....	0.00
20.....	30.05	77.9	63.3	62	e.	4	.....	0	.....	1.15
21.....	30.06	77.4	68.2	74	se.	9	.....	0	.....	0.27
22.....	30.01	75.9	67.5	76	.....	0	cs	7	w.	0.66
23.....	29.95	77.0	72.5	87	e.	7	c	10	w.	0.92
24.....	29.91	75.7	72.1	89	se.	2	ck	7	w	0.00
25.....	29.93	75.6	73.9	95	.....	0	n	10	.....	0.63
26.....	29.87	73.4	72.5	97	.....	0	n	10	s.	0.50
27.....	29.92	75.9	74.8	96	.....	0	n	10	.....	0.00
28.....	30.00	78.1	74.8	90	ene.	4	k	6	nnw.	1.70
29.....	30.04	78.1	74.3	89	.....	0	s	1	.....	0.00
30.....	30.04	76.6	76.1	96	ese.	2	k	1	.....	0.17
31.....	29.96	77.0	73.8	90	.....	0	ck	4	wnw.	1.19
Sum.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	11.90
Means.	30.00	77.4	69.3	78.1	.....	4.0	.....	3.7	.....	90.6

n = nimbus.

NOTES BY THE EDITOR.

CONVENTION AT OMAHA.

On April 5, the Chief of the Weather Bureau announced by a circular letter that a convention of Weather Bureau officials would be held at some time during the coming summer at Omaha, Nebr., the membership not to be restricted to officials engaged in the work of the Climate and Crop Service, but to include other officials of the Weather Bureau and a few invited specialists. As transportation rates are reduced on account of the Trans-Mississippi and International Exposition, it will be possible to make the journey at decidedly less than the usual cost. It is also expected that the Honorable Secretary of Agriculture will be present at some time during the convention. The general object of the convention is to afford opportunity for discussing methods for the extension and improvement of the work of the Bureau. Brief papers, not exceeding 1,500 words, relative to the practical and scientific work of the Bureau, may be submitted by any one interested in the convention. In order to properly arrange the programme, members are invited to suggest topics for discussion as early as practicable.

On account of the pressure of work at Washington, it has been found best to hold the convention as late as possible and a circular of July 7, announces that it will be held on Thursday and Friday, October 20 and 21. These dates will make it more convenient for section directors to leave their stations; doubtless the weather will also be much more agreeable than it is in midsummer, and it is hoped that there will be a large gathering of meteorologists. Those contributing papers or suggesting topics for discussion should correspond immediately with Mr. James Berry, Chief of the Climate and Crop Division, Weather Bureau, Washington, D. C. If the convention is as large as is expected, it will probably be necessary to establish the rule that no person shall speak more than once on a given topic, or for a longer period than five minutes, unless by unanimous consent.

The Commercial Club of Omaha has kindly tendered its rooms in the Board of Trade Building for the use of the convention. Special rates have also been conceded by hotels, ranging from \$1.50 upward.

EVAPORATION AND TEMPERATURE.

In the MONTHLY WEATHER REVIEW for April, page 167, we have given measurements of temperature at various depths in a quiet lake in New Brunswick; the measurements were made on July 1, 1896. In connection with this subject, Prof. L. G. Carpenter, as Chief of the Department of Civil and Irrigation Engineering at the State Agricultural College, Fort Collins, Colo., sends an early copy of Bulletin No. 45, published by the Agricultural Experiment Station connected with the college. This bulletin is devoted to the subject of loss of water from reservoirs by seepage and evaporation. From a meteorological point of view the evaporation into the free atmosphere has much interest.

We have already in Volume XXIII, pp. 421-422, explained how difficult, if not impossible, it must ever be to determine from ordinary observations of the evaporimeter the quantity of water added to the atmosphere daily by evaporation from the oceans, lakes, and continents. One of the principal elements of uncertainty in determining *a priori* the quantity of evaporation from a given surface of water consists in our uncertainty as to the temperature of the surface water and the velocity of the wind at the surface. If the evaporation observations are made in a shallow tank of quiet water, we

have then the still further difficulty of computing what the results would be on the surface of a flowing stream or lake of much greater depth. On page 24, Professor Carpenter says:

It will be noticed that the evaporation from the tanks floating in the various lakes is much greater than that from the corresponding tank on the grounds of the Agricultural College, which latter tank is of galvanized iron, 3 feet square and 3 feet deep, set in the ground at Fort Collins, so that its rim is flush with the surface of the ground. The elevation is 4,990 feet above the sea level, latitude $40^{\circ} 34'$, longitude 105° . The rain which falls into the tank is allowed for in accordance with the readings of a standard rain gauge near by.

The excess of evaporation from the tanks floating in the lakes over that from the tank sunk in the ground is partially, but not entirely, due to temperature. The tanks in the lakes are more freely exposed to the wind than the standard tank, and this would, therefore, make a great difference. The floating tanks are more or less agitated by the waves, and, consequently, the water surface exposed to the air is larger than the cross section of the tank. A film of water is also left on the metal side with every movement of the floating tanks, and this water is apt to be of a higher temperature than the water in the lake or in the tank and evaporates more rapidly. This influence was noticed by Mr. Trimble, who suggested it as a cause of some of the excess of evaporation observed from the lakes. The effect may be considerable, but how much is uncertain. The wave action differs in the different lakes. As the waves also increase the area of the surface of the lakes, which is exposed to the wind, the resulting measurement in the tank is possibly closer to the loss from the lake than if the tank had been stationary. The effect of increase of surface was an increase of 33 per cent, as deduced from the observations by Aymard in 1849.

Professor Carpenter gives the following estimate of evaporation from the surface of an open reservoir, at Fort Collins, as based on ten years of observations and corresponding, therefore, to the average cloudiness, windiness, and relative humidity of that location:

	Evaporation, in inches.
January.....	1.5
February.....	2.0
March.....	3.5
April.....	5.0
May.....	6.5
June.....	8.0
July.....	9.5
August.....	8.5
September.....	6.5
October.....	4.5
November.....	2.5
December.....	1.5
Total.....	59.5

The loss of water from either the natural or artificial reservoir may in part be due to seepage or the gradual filtration through the soil, but when the coarse gravels and sands of a freshly made reservoir are filled up by finer particles of clay we shall not be surprised to find that in such cases the filtration and seepage are quite small or inappreciable. When no such clay or silt or other fine sediment is formed the loss by seepage may entirely prevent the reservoir from holding water. In the Rigden Lake, Professor Carpenter finds the seepage to be about two feet in depth per year, and other cases of much greater loss are on record even after the adjacent subsoil may be supposed to have been entirely well filled with water. Everything depends upon the character of the soil, the deposit of silt, and the packing of clay.

Special attention has been given by Professor Carpenter to the temperature of the water in the standard evaporation tank and also in the reservoirs and lakes. As regards the tank, temperatures were observed at 7 a. m. and 7 p. m. as also by self-recording maximum and minimum thermometers, all near the surface. The mean of the 7 a. m. and 7 p. m., [one hundred and fifth meridian time] is less than the mean of the maximum and minimum by about 3.5° , and the latter is probably much closer to the true average. The difference is attributable to the fact that during the daytime the surface

heats rapidly and the lower layers slowly, but during the night-time the whole mass cools more uniformly. On the average of ten years the surface temperature in the tank, namely, the average of the 7 a. m. and the 7 p. m., is as follows:

April.....	49.0
May.....	58.9
June.....	67.9
July.....	72.7
August.....	70.8
September.....	63.4
October.....	51.2
November.....	41.6

During the other months of the year the tank, of course, is frozen.

The temperature of the free water in Lake Lee, at the surface and at the bottom 6 feet below, as also the temperature of the water in a small tank floating at the surface of Lake Lee, was read every fifteen minutes on August 6, 1896. Lake Lee is a small reservoir 4 miles from the college, shallow, exposed to the wind, and full of weeds that greatly hinder the formation of waves. The following is the temperature record:

Time of observation.	Clouds, tenths.	Wind.	Temperature of water.		
			Tank.	Lake.	
				Surface.	Bottom.
9:00 a. m.			71.0	70.2	68.8
9:15 a. m.	Few.		72.0	70.5	68.2
9:30 a. m.	Few.	Lt. SE.	72.0	70.7	68.0
9:45 a. m.	Few.	Lt. SE.	72.0	71.2	67.7
10:00 a. m.	Few.	E.	72.0	71.0	68.0
10:15 a. m.	1		72.8	71.7	68.8
10:30 a. m.	1	Lt. SE.	73.7	72.2	69.0
10:45 a. m.	2	Lt. SE.	74.0	72.9	68.6
11:00 a. m.	2	Lt. SE.	74.0	73.0	68.5
11:15 a. m.	3	Lt. SE.	74.0	73.0	68.2
11:30 a. m.	3	Lt. SE.	73.2	72.9	68.5
11:45 a. m.	3	Lt. SE.	74.0	73.1	69.1
12:00 noon	2	Lt. SE.	74.2	73.2	69.2
12:15 p. m.	2	Lt. SE.	74.8	74.0	68.8
12:30 p. m.	2	Lt. SE.	74.4	74.0	68.8
12:45 p. m.	3	Lt. SE.	74.5	74.2	69.1
1:00 p. m.	4	Lt. SE.	74.0	73.9	68.3
1:15 p. m.	6		74.2	74.2	68.7
1:30 p. m.	7	Brisk N.	73.8	73.8	69.1
1:45 p. m.	5	Lt. E.	74.0	74.0	69.4
2:00 p. m.	4	Lt. S.	74.9	74.7	69.8
2:15 p. m.	3	W.	75.7	75.0	69.4
2:30 p. m.	2	W.	75.5	75.0	69.5
2:45 p. m.	2		76.0	77.0	70.0
3:00 p. m.	1	SE.	76.6	77.2	69.3
3:15 p. m.	2	SE.	76.2	76.4	69.8
3:30 p. m.	2	SE.	76.2	76.0	69.0
3:45 p. m.	2	SE.	76.0	76.0	69.3
4:00 p. m.	1	SE.	76.0	76.0	68.8
4:15 p. m.	2	E.	75.8	76.0	68.2
4:30 p. m.	3	None.	76.0	76.2	69.0
4:45 p. m.	5	N.	75.6	76.7	68.7
5:00 p. m.			75.5	76.8	68.6

In reference to this table Professor Carpenter writes to the Editor as follows:

At different times we have carried on observations throughout the twenty-four hours on the evaporation tanks, measuring the temperature at the surface, and at one foot below the surface. One of the most marked results was that the average temperature, as determined by observations at twelve hours' interval, was less than the true average by several degrees. The increase in temperature during the day at the surface is quite rapid, and the surface temperature becomes much warmer than the water below the surface. On cooling, however, convective currents form, and the whole mass of water practically cools together.

I had observations carried on at hourly intervals for several days, at the surface and one foot below, which showed this fact clearly. For the last three or four years I determined the average temperature from the maximum and minimum temperatures instead of from the observations at 12-hour intervals, as had been done before.

CLIMATOLOGY.

In a recent letter from Mr. R. DeC. Ward, of Harvard University, into whose hands Prof. William M. Davis has recently resigned his classes of instruction in meteorology, Mr. Ward says:

I am interested in your note on page 168 on the use of the word climatology. I quite agree that those who study this subject from the botanic or agricultural point of view should use some such compound word as agricultural or botanic climatology. The word climatology alone means what we may describe as general climatology. In my own studies, which concern chiefly the human side of climatology, i. e., the relations of climate and man, I have adopted the compound word anthropo-climatology (Science, November 20, 1896, pp. 749-750). It seems to me that this side of climatology is so special that it should not be designated as climatology pure and simple, any more than the agricultural or botanic side of climatology should be so designated.

BLUE HILL OBSERVATORY.

The following statement by the Editor in the MONTHLY WEATHER REVIEW for December, 1897, page 541, describing the meteorological stations of Harvard University, "By an arrangement with the Park Commissioners of the city of Boston, the upper portion of Blue Hill was purchased in 1875, and transferred to the care of Harvard Observatory. This hill is about eight miles south of the observatory," * * * contains an unfortunate typographical error, lately discovered by the Editor, and included in the corrigenda published in the proper place in the current number of the MONTHLY WEATHER REVIEW.

Meanwhile, Mr. Rotch, Director of the Observatory, has, independently, called our attention to this error, and furnishes the following accurate brief historical note on the relations between the Harvard and Blue Hill observatories:

The Blue Hill Meteorological Observatory was established by A. Lawrence Rotch in 1885 upon Great Blue Hill, 12 miles south of Harvard Observatory and several miles outside the limits of the city of Boston. About 60 acres of land on Blue Hill were subsequently purchased by Mr. Rotch to guard his observatory against encroachment. In 1893 the Blue Hills were taken by the Commonwealth of Massachusetts for a public reservation, and although the land owned by Mr. Rotch was paid for, the observatory was allowed to remain. In order to insure the continuance of the observations under invariable conditions of exposure, the land upon which the observatory stands and immediately surrounding was, at Mr. Rotch's request, leased by the Commonwealth to Harvard College in 1896 for ninety-nine years. The expense of maintaining the observatory, which now exceeds \$4,000 a year, continues to be paid by Mr. Rotch, but the cost of publishing the observations and investigations, annually or oftener, since 1887, in the Annals of the Astronomical Observatory of Harvard College, is shared by the Harvard Observatory.

INSURANCE AGAINST DROUGHT.

The Editor has received from Mr. Blythe, Weather Bureau observer at Phoenix, Ariz., a published article, by Mr. Chas. W. Pugh, advocating the insurance of crops and other property against destruction by drought. He states that there are several forms of insurance for live stock, crops, and other farm products; they are insured against fire, water, hail, lightning, hot winds—why not against droughts? The amount of injury and the chance of injury from drought can easily be ascertained by the study of local statistics during the past twenty-five years. The insurance company will have to give an exact definition of drought and establish a rate of insurance. The policy holder will have to prove that a given injury was really due to a drought.

This new feature of insurance seems perfectly feasible, but it would at the present time not be possible to carry out one of the items suggested by Mr. Pugh, viz, that the Weather Bureau shall make a general prediction of the coming season so that the farmers in any locality may know whether it is worth while to insure against drought as predicted for a given season. There are two objections to this feature: First, that the Weather Bureau has not attempted to make seasonal predictions, much less scored any great success therein. Second, that when it does do this successfully then the insurance companies will make nothing and, therefore, quickly be broken up, since their customers will patronize them only when they are sure that droughts are coming.

THE CHARACTER OF THE EVENING.

The following remarks by Mr. Lee A. Denison, observer, Weather Bureau, at Albany, in a letter dated September 27, 1897, are commended to the attention of all observers:

I have the honor to suggest that where two or more observers are serving on station the "Character of the evening," as in the case of the "Character of the day," be entered in the Daily Journal.

By the "Character of the evening" I refer especially to the general effect of the state of the weather, combined with starlight or moonlight, or both, upon the darkness and therefore on the sight of the traveler, pedestrian, and others, exposed at this period of the twenty-four hours. The length of time included in the term "evening" is from the end of twilight to midnight.

It can not be denied that a large percentage of accidents occur during the evening and a careful observation of the "Character of the evening" will be of great value when the records of the Bureau are produced before the several courts of the country.

It occurs to me that a scale, as in the case of cloudiness—0 to 10—somewhat similar to the following, might answer the purpose in describing and estimating the conditions as to darkness:

Clear with half to full moon	0
Clear with new to half moon	1
Partly cloudy with half to full moon	2
Partly cloudy with new to half moon	3
Cloudy, upper clouds, with half to full moon	4
Cloudy, upper clouds, with new to half moon	5
Clear with starlight	6
Partly cloudy with starlight	7
Cloudy, upper clouds, with starlight	8
Cloudy with starlight	9
Cloudy, rain, or fog, with starlight	10

It has been found impracticable to enforce the above suggestion upon all Weather Bureau stations, but it is so excellent that the Editor commends it for consideration by all.

CLIMATE OF LIBERIA.

Ever since 1871 the Weather Bureau has endeavored to collect data bearing upon the origin of our West Indian hurricanes, some of which have been traced backward to points near the African coast, so that it seems likely that these originated in that region. Instruction has been given and apparatus furnished to observers who contemplated living in Liberia in order to obtain and enter data upon the daily weather map of the Northern Hemisphere, but direct returns have been rare. Lately we have received from Prof. O. F. Cook a short climatological table, which adds considerably to the data in hand. Mr. Cook and his colleague, Mr. Collins, representing the University of Syracuse, N. Y., have spent a number of seasons in Liberia in the study of natural history. On the second expedition they landed in Monrovia, January 3, 1894, and left July 22. Their stay was divided between Monrovia and the experimental farm at Mount Coffee, whose summit is 320 feet above sea level. The following observations of temperature were apparently made on Mount Coffee, but as the whole region for twenty miles inland does not ascend to a greater height than 300 feet above the ocean it is probable that these fairly represent the climate of the lowlands near the coast. The tide in the St. Pauls River is appreciable up to the rapids near Muhlenberg Mission, 20 miles from its mouth. A permanent station was built by Messrs. Cook and Collins for their scientific work on Mount Coffee, 10 miles from the boat landing at White Plains and 140 feet above the level of St. Pauls River at that place. The following thermometric record is copied from pages 27-30 of the "Second Report of Prof. O. F. Cook to the Board of Managers of the New York State Colonization Society, October, 1894. John Bingham, Printer. New York City:"

Mr. Collins kept, when convenient, a record of the readings of the thermometer and hygrometer, from which the following table was made. It will be seen that the temperature, while never excessive, is constantly high. The season was generally considered to be a hot one, and the records cover the hot months of the year. The readings were taken in shaded, well ventilated locations, care being taken, however,

to protect the hygrometer from currents of air. The hygrometer columns give the difference in degrees between the wet and dry bulbs of a tested instrument.

The lowest temperature noted was 62°, registered at 7 a. m., January 20. The next day at the same hour the temperature was 68°. An attempt was made to get the temperature in the sun, but our thermometer registers only 115°.

Hour of reading.	Thermometer.				Hygrometer.				Rainfall, number of—	
	No. of readings.	Maximum.	Minimum.	Mean.	No. of readings.	Maximum.	Minimum.	Average.	Days.	Hours.
Jan., 9 a. m.	21	79	72	76.9	21	5	1	2.2	5	5
12-2 p. m.	23	85.5	79	82.6	23	10	2.5	4.7		
4-6 p. m.	22	82.5	73.5	80.7	22	5.6	2.5	3.6	1	1
Feb., 9 a. m.	15	83	74	78.5	15	6	1	3.1		
1-2 p. m.	15	86.5	78	83.9	15	10	1	6		
5-6 p. m.	14	83	77	81.2	14	5.5	2	3.1		
Mar., 9 a. m.	20	82.5	73	78	20	6	1	2.8	7	6
1-2 p. m.	12	89	80	86.7	12	6	5	5.3		
5-6 p. m.	11	83.5	79	81.4	11	4.5	3	3	17	41+
Apr., 9 a. m.	11	87	75.5	83.1	11	6	1	4		
1-2 p. m.	8	92	83	88.7	8	10	2	4.3		
5-6 p. m.	6	84	74	78.6	6	4	1	2.3		
May, 9 a. m.	9	84	72	79.2	7	5	5	2.8	16	35+
12-1 p. m.	13	93	74	83.5	12	6	1	3.6		
June, 9 a. m.	11	83	76	79.6	11	3	1	2.1	23	106+
12-2 p. m.	13	87	74.5	82.2	12	7	1	3.7		
5-6 p. m.	4	78	74	75.5	3	5	1	2.7		

THE RAINFALL AND OUTFLOW OF THE GREAT LAKES.

On pages 164-166 of the MONTHLY WEATHER REVIEW for April, 1898, the Editor has computed, for each of the Great Lakes, respectively, the available surplus of water, viz, the inflow from the upper lake, the direct rainfall plus the run off from the surrounding watershed less the annual evaporation, and has shown that the computed surplus decidedly exceeds the measured outflow. The excess is so large that it argues a corresponding uncertainty in all the data entering into the computation and fully confirms the conclusion expressed in the first report of the United States Deep Waterways Commission, viz, that every effort must be made to obtain better and more reliable data. To this end, in fact, the present United States Board of Engineers on Deep Waterways has been organized, and the following extracts from letters of G. Y. Wisner, C. E., a member of this Board, show the present condition of our knowledge of the subject:

Lake Erie.—The discharge into Niagara River for mean lake level will probably prove to be about 235,000 or 240,000 cubic feet per second (instead of 250,000, adopted on page 164).

Lake Superior.—The outflow, namely, the discharge through St. Marys River, was determined in 1895, by Mr. Haskell, as 72,600 cubic feet per second for mean lake level, instead of the 86,000 formerly adopted.

Lake Michigan plus Huron.—The discharge of the St. Clair River will probably be diminished proportionately, viz, about 10 or 12 per cent, reducing it from 225,000 to 200,000.

Lake St. Clair.—The discharge of Lake St. Clair, through Detroit River, will fall below 200,000 cubic feet per second for mean condition.

As regards the run off for Lake Superior, a fair estimate for the watershed is 40 per cent, as the country surrounding the lake is very rolling and rocky. For lakes Michigan, Huron, and Erie, 33 per cent is about right.

Adopting these values we have the following results:

Lake Superior.—Total supply 4.2 feet, total discharge 2.6 feet, leaving 1.6 foot for evaporation and errors in the estimates.

Lake Huron plus Lake Michigan.—Total supply 6.6 feet, total discharge 5.0 feet, leaving 1.6 foot for evaporation and errors in the estimates.

Lake St. Clair plus Lake Erie.—Total supply 27.8 feet, total discharge 25.5 feet (adopting 235,000 feet per second), leaving 2.3 feet for evaporation and errors in the estimates. Discharge for Lake Huron is probably less than 200,000, which would increase this excess by 20 per cent above the estimate for Lake Huron and decrease that for Lake Erie.

Nothing more definite can be hoped for until the final report of the engineers who are now at work on the physics of the lakes and waterways.

Evaporation is the most uncertain element in the solution of this problem, due to the fact that evaporation, as determined at observation

stations, in noways represents the true conditions on the lake surfaces during windy weather. The lake surface is increased to a considerable extent by wave action and the contact with constantly changing air and spray blown from waves make conditions which almost render the problem indeterminate.

Mr. Wisner adds:

The run off above given is that which, from a personal knowledge of the country, seems reasonable to me. The discharge of the St. Marys, 72,600, is, I think, very nearly correct. The discharge of the St. Clair River for mean conditions does not, in my opinion, exceed 200,000 cubic feet per second. In this connection I wish to call attention to the fact that the discharge of Lake Huron depends on both the stage in Lake Huron and in Lake St. Clair. Owing to the fluctuation of Lake Erie being greater than for Lake Huron, the minimum slope of the St. Clair River occurs at the high stage of the lakes, and the maximum slope at the minimum stage, a condition which has not been heretofore considered, and which plays an important part in the fluctuations of both lakes. The St. Clair River is only 750 feet wide at its head, and a large part of any change of slope is concentrated in the rapid at the foot of Lake Huron, which simply means that the maximum discharge is not necessarily at the maximum stage of Lake Huron.

We are now making additional observations for the discharge of Niagara River at a higher stage than when observations were made last fall, which may change the result obtained then.

I feel quite confident now that the discharge for mean stage will likely fall between 230,000 and 240,000 cubic feet.

OCEANIC AND SEISMIC NOISES.

The following extract from the English journal, *Nature*, for June 9, 1898, Vol. LVIII, page 130, is of interest in connection with the article on page 152 of the MONTHLY WEATHER REVIEW for April which was published almost simultaneously, and without knowledge of the Italian article referred to by our contemporary:

The mysterious phenomenon known as "Barisal guns," or "Mist poefferers," forms the subject of a useful paper by Dr. A. Cancani, in the last *Bollettino*, Vol. III, No. 9, of the Italian Seismological Society. The observations on which his discussion is founded are collected from places in or near the inland province of Umbria, where the noises are known as "marina," it being the popular belief that they come from the sea. The sound is quite distinct and easily recognized; it is longer than that of a cannon shot, and though more prolonged and dull, it is not unlike distant thunder. It invariably seems to come from a distance, and from the neighborhood of the horizon, sometimes apparently from the ground, but generally through the air. The weather, when the "marina" is heard, is calm as a rule, but that it often precedes bad weather is shown by the common saying, "Quando tuona la marina o aqualo vento o strina" (when the ocean thunders, expect rain or wind or heat). The interval between successive detonations is very variable, sometimes being only a few minutes or even seconds. They appear to be heard at all times of the day and year, the experience of observers differing widely as to the epochs when they are heard most frequently. With regard to the origin of the "marina," Dr. Cancani concludes that they can not be due to a stormy sea, because "mist-poefferers" are frequently observed when the sea is calm; not to gusts of wind in mountain gorges, for they are heard on mountain summits and in open plains. If their origin were atmospheric they would not be confined to special regions. Nor can they be connected with artificial noises, for they are heard by night as well as by day, and in countries where the use of explosives are unknown. There remains thus the hypothesis which Dr. Cancani considers the most probable, that of an endogenous origin. To the obvious objections that there should always be a center of maximum intensity, which is never to be found, and that they are so rarely accompanied by any perceptible tremor, he replies that, in a seismic series, noises are frequently heard without any shock being felt, and of which we are unable to determine the center.

ELECTRICAL STORMS IN KANSAS.

Mr. T. B. Jennings, Section Director of the Kansas Section of the Climate and Crop Service, reports that—

The western counties of that State are occasionally swept by a wind-storm, denominated by the plainmen as an "Electrical storm," though no thunder or lightning occurs and the weather is generally clear; it is a broad wind, blowing with great force; a person exposed to it soon becomes filled with electricity, and on approaching a stove electric sparks will pass from his hands to the stove; the housewife wraps her hands up in rags to handle the stove utensils. It is difficult to realize the conditions in such a windstorm until one experiences them; the electrical conditions are not uniform but confined more to currents or streaks; growing grain and foliage on trees exposed to

these conditions become more or less scorched, and sometimes the grain crop is completely killed. Such winds (electric storm) are most frequently from the northwest.

The mountains of Colorado, and doubtless other parts of the country, frequently experience electrical storms that appear to be very similar to those described by Mr. Jennings. The wind blows severely from the west; the air is sometimes quite dry but more often filled with the finest forms of vapor condensation; a steady stream of electrical discharges flows from every sharp point, whether of rock, or plant, or dwelling; the observer feels a tingling and cooling sensation, precisely similar to that experienced when taking an electrical bath treatment, and hears the singing due to the thousands of discharges going on all around him. Occasionally our observers on Pikes Peak have had too intense an experience; flashes and balls of lightning have played all around them within the observing station and the iron stove has been ablaze with continuous electrical discharges, yet nothing serious occurred. On a neighboring summit the field party sent out by the Coast and Geodetic Survey, in 1893, (?) reported far more serious storms of several hours' duration on successive days, entirely preventing work and injuring the instruments.

It is not yet satisfactorily ascertained whether the electricity of such storms originates in the earth or in the atmosphere or in the space beyond. If the latter, then we may trace it to the sun; if it comes from the air, we must attribute the origin of the electricity to some peculiarity in the processes of evaporation and condensation; if it comes from the earth, then it must originate in the compressions and shocks and friction that attend earthquakes and the outflow of lava. We do not see our way clear to indorse the popular idea that the electricity is generated by the wind or by the friction of particles rolled along by the wind, or by the melting of snow crystals, as suggested by Mr. Couch. In fact, the problem is evidently too difficult for our present limited knowledge.

The first step to be taken in investigating the true nature of these electric storms must consist in a collection of data showing the places and dates of their occurrence, and the collection must be sufficiently exhaustive to show when and where they do not occur as well as where they do. It is also necessary to distinguish between the injury done to plants by electricity and that done by the drought and the evaporation that accompany hot, dry winds in Kansas and the western plains. Reports of the occurrence of these storms will be very acceptable. A graphic account of the storm of October 27, 1894, is given on p. 120, *American Meteorological Journal*, Vol. XII, August, 1895.

METEOROLOGICAL SUPERSTITIONS.

The tendency of mankind to regard any unusual meteorological phenomenon as a special message from on high, announcing the speedy occurrence of some event of importance either to the individual or to the whole human race, is well illustrated by a note in the April report of Mr. Earl Flint, at Rivas, Nicaragua. With reference to the halo recorded by him on April 26, he says: "Many called my attention to the halo as they saw three extra suns. Last year for a similar occurrence at St. George the town was called out, believing it a forerunner of some calamity; but here at Rivas, they made it the precursor of the earthquake."

An inclosed slip from the Managua Daily gives a long series of connections between halos and both good and bad events in the history of the world. Of course, any one familiar with chronological tables could pick out a thousand more such coincidences without demonstrating any connection between halos and the history of the human race further than the general principle that remarkable events are continually occurring both in the heavens and on the earth, and that an

event in either of these classes is preceded by one in the other class, so that it is quite as proper to say that human events are forerunners of remarkable celestial phenomena as it is to reverse this statement. The article in the *Managua Daily* gives the proper optical explanation of the nature of the phenomena of halos as formed by the action of ice needles in thin cirrus clouds upon the beams of light from the sun; it also shows that halos are as often followed by good events as by evil, but it fails to bring out as clearly as is desirable the great principle that men must banish from their thoughts every tendency to imagine that meteorological phenomena have even the slightest value as prophetic signs or prognostics of future events among mankind.

FROST FORMATIONS AND ICE COLUMNS.

We are indebted to Prof. D. T. MacDougall, of the University of Minnesota, at Minneapolis, for the following references to recent publications on this subject, in continuation of the short notes published in the *MONTHLY WEATHER REVIEW* for May and July, 1897:

MacDougall, D. T. *Science*, 1893, Vol. XXII, p. 851.

MacDougall, D. T. *Botanical Gazette*, 1894, XIX, p. 120.

Ward, Prof. Lester F. *Botanical Gazette*, April, 1893.

Bay, J. C. *Botanical Gazette*, 1894, XIX, p. 321.

Professor MacDougall states that he expects to carry on some experimental work on plant life in the San Francisco mountain range near Flagstaff, Ariz., during the coming season. Any person in that vicinity who keeps meteorological records will confer a favor by corresponding directly with him. It is hoped that some one in that region or some institution will maintain a continuous thermograph record.

PRAIRIE SKIES.

The following extracts are from a recent letter by E. J. Couch, voluntary observer at Cornlea, Nebr.:

Our prairies have rains principally in spring and summer. A general absence of cloud in the surface current gives opportunity to observe the upper air currents. Observation leads to certain generalizations. The rains seem to have their origin principally in the air currents at moderate elevations. The surface clouds are generally fog, scud, or squall. In spring the whole upper atmosphere seems to lift; and the air currents bring moisture from an easterly or southerly direction which falls as rain at the front of a low or with a sudden fall in temperature. The summer rains at times are similar, but they arise often from thunderheads.

When thunderheads project into a current above that is calm, the cloud spreads out forming the anvil cumulus. In most cloud areas we note two or more motions. A roll or rotating motion and a forward motion; clouds expand or contract with advancing or closing day, or with increase or decrease in evaporation.

A NEW GAS IN THE ATMOSPHERE.

Prof. William Ramsay and Mr. Morris W. Travers announced to the Royal Society at London on June 9, and to the Academy of Sciences at Paris on June 6, their discovery of a new constituent of atmospheric air to which they propose to give the name "Krypton," referring to the fact that it has been so long concealed from our knowledge. On the other hand the French chemist Berthelot suggests the name "Eosium" on account of the distinctive bright green line in the spectrum of this new element. This line is in almost the same position as the green line in helium and, as was suggested by Professor Schuster as well as independently by Berthelot, this line also agrees with the green line of the aurora borealis. As physicists are agreed that the light of the aurora must come from an incandescent gas, although its temperature is low as compared with most of the incandescent substances that are dealt with in our laboratories, it would seem certain that the incandescence of "Krypton" does contribute to the brilliancy of the aurora. The following table

gives approximately some idea of the relative proportions, both by volume and by weight, of the gases that have thus far been discovered in the lower portion of our atmosphere.

Near sea level, under a standard pressure of 760 mm. of mercury at 0° C. and standard gravity, the dry gases of the atmosphere have densities, volumes, and pressures as follows:

	Volumes.	Pressures.	Densities.	Weights.
	<i>Per cent.</i>	<i>Mm.</i>	<i>Kg. p. m³.</i>	<i>Per cent.</i>
Oxygen	20.95	159.22	1.10563	25.16
Nitrogen	79.02	600.55	0.97137	76.77
Carbonic acid gas	0.03	0.23	1.5201	0.06
Dry air	100.00	760.00	1.29322	99.976

The remaining constituents, argon, helium, krypton, and ammonia, represent quantities far less than carbonic acid gas. What these proportions may become 10 miles above the earth's surface can hardly be stated as yet. The relative density of the new gas, taking hydrogen as unity and oxygen as sixteen, is as follows:

Krypton, 32.321 cubic centimeters at pressure 521.85 millimeters and temperature 15.95° C. weighed 0.04213 gram, or a density of 22.47. A second determination gave 22.51.

Like argon and helium, krypton is probably monatomic; it is heavier than argon and less volatile than nitrogen, oxygen, and argon. But Professor Ramsay states that its density is at present problematic, and it may be that the gas belongs to the helium series and has a density of 40, with an atomic weight of 80. The spectrum of the gas is characterized by two very brilliant lines in the yellow besides the brighter green line before mentioned and a somewhat weaker green line. In order to obtain a small quantity of this gas for their observations, the authors state that they obtained about 750 cubic centimeters of liquid air; all but 10 cubic centimeters were allowed to evaporate away slowly; the residue was secured in a gas holder and after removing the oxygen and the nitrogen, there was left 26 cubic centimeters of a mixture of argon and krypton.

The authors conclude by saying: "We have already spent several months in preparation for a search for a gas lighter than nitrogen that may possibly be found in the air and will be able to state ere long whether this supposition is well founded."

SAMUEL E. BLACK.

Mr. Samuel E. Black, observer, Weather Bureau, died May 21, 1898. Mr. Black entered the meteorological service by detail from the Office of Director of Experimental Stations, Department of Agriculture, August 21, 1894, and July 31, 1895, was transferred to the Weather Bureau. He was assigned to duty as assistant at the station at Colorado Springs, Colo., until September 17, 1894, following which he served in the same capacity at Denver, Colo., until September 5, 1896, and then at Santa Fe, N. Mex., until the date of his death.

NOTES FROM THE REPORTS OF THE CLIMATE AND CROP SECTIONS.

ARIZONA.

Mr. Henry M. Gee, voluntary observer at Tombstone, notes that during May, "day after day the wind was easterly in the morning, south about noon, and southwest the rest of the day." Nearly all the other observers in Arizona report that the month has been very windy at least in the daytime, and in general they report that the prevailing direction was southwest.

If the diurnal change in the direction of the wind was at other stations similar to that at Tombstone, which is in the northeast corner of Arizona, it would constitute a general

phenomenon that is eminently worthy of an attempt at a general explanation. At the surface of the ground, on plateaus and lowlands, the wind is calm or comparatively light during the nighttime because the colder air near the surface does not partake of the movement that prevails overhead. But during the daytime, when the lower stratum is heated and rises, the upper stratum descends bringing with it its great horizontal velocity, and the direction of the wind, as well as its velocity at the surface, will depend upon the height from which the upper current comes down. Thus, if an east wind descends into calm air the result would be a lower east wind; if subsequently a south wind descends into the latter, it will become a southeast wind and if, afterwards, a west wind descends into the latter, it may become a southwest wind. A careful study of the cloud motions will, undoubtedly, help the observer to explain the diurnal veering, or backing, of the surface wind as it progresses from hour to hour during the day.

ARKANSAS.

Mr. E. E. McCollum, voluntary observer at Moore, notes that "on the night of the 21st there was a heavy cloud in the northwest, with wind; the lightning played continuously and a body, like a large meteor, seemed to burst from the cloud and float slowly to the east until it passed out of sight."

This reads exactly like a case of ball lightning, for large meteors can scarcely be said to float slowly. Faulkner County is near the center of Arkansas, and if any one else north of Mr. McCollum was so fortunate as to have observed this bright ball it would be very interesting to determine its height and velocity by comparing the two records. In general, ball lightning has been sufficiently well observed to establish the fact of its existence, but no plausible explanation of its nature has yet been considered acceptable to physicists; every observed fact bearing upon it is of value.

COLORADO.

Mr. Brandenburg continues his monthly summary of snow in the mountains. In general, heavy precipitation characterized the entire month in the foot hills and plains, but this only extended westward into the mountainous region to a small extent, and practically none fell on the westward side of the Continental Divide.

At Canon City a severe hailstorm occurred on the 21st, lasting forty minutes. The hail belt was about 5 miles wide east and west, and in some portions the ground was covered to a depth of 8 inches.

INDIANA.

The observer near Portland, in Jay County, reports that on the evening of May 18 a heavy hailstorm prevailed at Fort Recovery near that city; hailstones over 10 inches in circumference, and weighing six ounces, were picked up; even iron roofs were punctured and much damage done. It would be a fair problem for an observer to determine by actual experiment what the speed of a falling hailstone must be in order to accomplish the destruction that he witnesses. Hail or ice can probably be fired from guns or cannons with a small charge of powder in such a way as to determine the velocity required to produce any given destruction. The statement as to the size of the biggest stones is not quite so important to the meteorologist as a statement of the average depth of the hailstones, or still better, the equivalent depth of the solid sheet of ice. The following rule, given on page 399 of the MONTHLY WEATHER REVIEW for September, 1897, refers to the case of spherical balls of ice, namely, the sphere of ice, when converted into a hexagonal cylinder that precisely incloses or circumscribes the sphere, will cover that hexagon to the depth of 0.6045 times the diameter of the sphere. In other words, a layer of continuous spheres of ice four inches

in diameter is equivalent to a solid layer of ice 2.418 inches thick. But as the fall of hail comprises stones of every variety of diameter, the simplest method for the observer is to gather all the hail that falls on a small area, equal to say, five times the area of the mouth of his rain gauge, put it all into the gauge, and when melted measure and divide by 5 to get the equivalent rainfall, or in this case, the equivalent sheet of ice.

IOWA.

A newspaper paragraph, quoted from the Sioux City Journal, says that at Sabula, 3 miles north of the late destructive tornado of the 17th, when scarcely a breath of wind was stirring at the place, the iron roof of a large warehouse in town was lifted and thrown into the street at the same time that those near the building felt the air grow hot. We can easily understand that a sudden diminution of barometric pressure over Sabula would allow the air within a warehouse to expand and lift off the roof; this is a common occurrence in tornadic phenomena; but we do not quite understand why the air in the neighborhood of the building should grow hot at this moment, and hope that some observer will give us a more minute account of the whole series of phenomena.

MONTANA.

There is no doubt but that the enthusiasm of Mr. Eddy and Mr. Woglom of New York City in the matter of kite flying has been of the greatest possible service both to meteorologists who raise their apparatus by means of kites and to patriots who insist on raising the American flag as high as possible. Mr. James T. Woods, of White Sulphur Springs, Meagher County, in central Montana, in the valley of the South Fork of the Deep River, and about 40 miles east of Helena, gives a description of his use of the Hargrave kite for raising a large United States flag to a height of 1,400 or 1,500 feet, so that it could be distinctly seen from all the ranches within several miles. We beg to commend to Mr. Woods the importance of the work that he can do for meteorology by using his kites to determine the temperature and the winds and the heights of clouds for several thousand feet above his station, which is probably already 4,000 feet above the ocean. The good work done by Mr. Allen at Bayonne, N. J., as published in the April number of the MONTHLY WEATHER REVIEW, should serve as an incentive to many other enthusiastic kite flyers. Every station has its own local peculiarities as to diurnal and local winds, which can be best investigated by the help of the kite. The work of the voluntary observers in America ought to rival that done by their colleagues in Europe in the investigation of local peculiarities that must eventually prove to be of great interest for general meteorology.

NORTH CAROLINA.

An unusual number of stations report remarkable hail and hailstorms. The general distribution of hail is frequently such that the heaviest occurs only in the lowlands and flat countries, but in North Carolina the most destructive seems to have been midway between the lowlands and the mountains. It would be worth inquiring whether the statistics of the last twenty years show any law of this kind.

RECENT EARTHQUAKES.

Prof. E. W. Morley, of Adelbert College, Cleveland, Ohio, and Prof. C. F. Marvin, of the Weather Bureau, Washington, D. C., report no earthquake disturbances of their respective seismoscopes during the month of May. Other reports have been received as follows:

April 29.—Managua, Nicaragua. Concerning this earthquake, Mr. Chester Donaldson, United States Consul at Managua, reports as follows in a letter dated May 4:

Unusually severe earthquake at 10:45 a. m. Beginning very light it gradually increased for about forty seconds until everything was shaken in earnest, then it decreased in strength and passed away in about ten seconds more. Every house in the city was more or less damaged by plaster falling, the mud or adobe walls cracking and the loose tiles on the roofs shaking off. No well built house of lumber, stone, or brick suffered any considerable damage; but one badly constructed house with old mud walls and weak roof fell in.

In Leon and Chinandega the earthquake was much more severe, leaving several buildings in ruins and injuring a few people. In these countries they have a habit of building very loosely. Many houses are constructed of blocks of mud laid up without any mortar or cement of any kind to hold them together. They also lay the tiles on the roofs without any fastening whatever. These buildings were of course badly shaken up and all the tiles need relaying.

As far as I know there was not a single death caused by this phenomenon. Since its occurrence there have been two or three slight tremblings every day until to-day. We have had none now for over twenty-four hours.

April 29.—Rivas, Nicaragua. Mr. Earl Flint reports earthquake at 10:25 a. m. (? local time); duration forty-seven seconds; from northwest; very sharp after the thirtieth second.

April 30.—Rivas, Nicaragua, 11 p. m., slight shock. The earthquake of the 29th was of longer duration and greater force on Simon, west of Managua, where large trees were uprooted. The large fissures near Managua show that the direction of the shock was east and west, whereas near Rivas it was northwest and northeast. At Managua many of our large buildings were destroyed but the adobe buildings used in this community have but little power to resist an earthquake shock. As no severe shocks have occurred at Rivas for a long period, Mr. Flint concludes that there is no danger whatever of serious injury to the construction works of the Nicaragua Canal Company, and he has submitted a long report on the geology and stratification of this region in substantiation of his conclusion.

May 1.—Ontario, Cal., slight shock 1:12 a. m. Sunday morning.

May 6 and 29.—Rivas, Nicaragua. Mr. Earl Flint says:

In my report for April I noted the severe earthquake of April 29, which was repeated on the 6th and 29th of May. Had surmised its origin as Momotombo, as that mountain is emitting smoke and ashes. The Government Canal Commission believes the earthquake originated at Santa Clara, finding there recent fissures, and considers Momotombo, as an outlet of gases, a safety valve like Ometepe, which erupted in 1883, since when it has not failed to emit smoke and sulphurous fumes. My nephew ascended the latter some two months since and found sulphur and sal ammoniac. He was there when two of the Canal Commission ascended on the same day as the earthquake.

June 2.—Trembling at Masaya, Nicaragua.

CORRIGENDA.

REVIEW for December, 1897, Vol. XXV, p. 540, second column, line 4 from bottom, for "11,378," read "3,300;" page 541, line 5, for "1875" read "1895;" page 541, line 6, for "8", read "12," page 542, column 1, line 7 from bottom, for "December 15" read "December 29."

MONTHLY WEATHER REVIEW, February, 1898, p. 59, second column, line 9, and also in the corresponding paragraph on pages 103 and 163: The published reduced barometer for Port au Prince, Haiti, has been corrected for instrumental error and temperature of attached thermometer and the reduction to sea level, but has not been reduced to standard gravity; it, therefore, needs an additional correction of -0.064 . This remark applies to all the published data from Port au Prince, according to a statement just received from Professor Scherer on his monthly record for May, 1898. The lines of text referred to should, therefore, read as follows: "The barometric readings have been corrected by Professor Scherer for temperature and elevation, but not for gravity."

MONTHLY WEATHER REVIEW, April, page 141, column 1, line 18, should read as follows: "A stage of about 44 feet will be reached at Evansville Wednesday, and a stage of about 47 feet at Cairo by noon Wednesday, the 30th." Page 165, column 1, line 25, for "22,500" read "225,000."

METEOROLOGICAL TABLES AND CHARTS.

By A. J. HENRY, Chief of Division of Records and Meteorological Data.

For text descriptive of tables and charts see page 172 of REVIEW for April, 1898.

TABLE I.—Climatological data for Weather Bureau Stations, May, 1898.

Stations.	Elevation of instruments.			Pressure, in inches.		Temperature of the air, in degrees Fahrenheit.										Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.	
	Barometer above sea level, feet.	Thermometers above ground.	Anemometer above ground.	Mean actual, 8 a. m. and 8 p. m. + 2.	Mean reduced.	Departure from normal.	Mean max. and min. + 2.	Departure from normal.	Maximum.	Date.	Minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.						Miles per hour.	Direction.	Date.
New England.																												
Eastport.....	76	69	74	29.90	29.99	+ .08	52.8	+ 1.1	65	22	54	32	10	42	44	41	33	4.31	+ 1.3	9	6,251	s.	39	s.	11	7	9	6.6
Portland, Me.....	103	81	89	29.85	29.95	+ .10	52.6	+ 1.0	79	20	59	35	10	46	48	44	38	2.62	+ 1.0	13	5,619	s.	30	s.	12	5	12	6.9
Northfield.....	872	15	65	29.02	29.96	+ .01	51.8	+ 1.9	75	19	62	27	9	41	37	43	43	2.10	+ 1.0	12	6,806	s.	34	n.	31	4	11	7.3
Boston.....	125	115	181	29.84	29.98	+ .00	55.8	+ 0.7	84	20	68	39	10	49	36	50	46	4.33	+ 0.7	10	7,969	ne.	36	ne.	8	6	11	6.7
Nantucket.....	14	43	54	29.97	29.98	+ .00	51.4	+ 1.1	68	28	57	30	5	46	17	49	47	3.53	+ 0.0	16	8,270	sw.	40	e.	8	4	7	7.6
Woods Hole.....	22	51	57	29.97	29.98	+ .00	52.6	+ 0.9	71	20	57	36	9	48	18	49	47	4.66	+ 1.3	13	8,286	s.	38	sw.	19	12	7	5.6
Vineyard Haven.....	27	39	48	29.95	29.98	+ .02	53.9	+ 1.9	77	20	62	37	8	48	23	49	46	6.19	+ 2.7	17	10,407	sw.	72	ne.	8	7	10	14.0
Block Island.....	27	39	48	29.95	29.98	+ .02	51.4	+ 1.0	73	20	56	38	9	47	20	49	46	6.54	+ 2.8	18	10,407	sw.	72	ne.	8	5	14	12.6
Narragansett Pier.....	107	118	140	29.85	29.97	+ .03	53.9	+ 0.7	83	20	61	32	10	47	28	51	48	8.96	+ 4.9	16	6,700	s.	45	n.	8	9	7	6.3
New Haven.....	107	118	140	29.85	29.97	+ .03	55.8	+ 1.8	84	20	63	35	8	48	38	51	48	8.03	+ 4.4	23	6,700	s.	45	n.	8	9	7	6.3
Mid. Atl. States.																												
Albany.....	97	84	113	29.86	29.97	+ .01	58.2	+ 1.1	79	31	66	40	9	50	29	52	48	7.77	+ 0.9	18	5,181	s.	25	n.	8	7	6	18.7
Binghamton.....	875	79	90	29.86	29.96	+ .04	56.4	+ 0.4	78	19	65	35	9	48	34	48	80	4.02	+ 0.1	18	4,515	ne.	37	w.	19	5	11	6.9
New York.....	314	298	326	29.86	29.96	+ .04	56.6	+ 2.9	86	30	63	38	8	50	22	51	48	5.55	+ 2.4	21	7,813	se.	40	ne.	8	6	7	18.6
Harrisburg.....	377	94	104	29.85	29.96	+ .02	61.8	+ 1.6	86	30	70	41	9	53	29	55	50	7.13	+ 1.4	16	4,507	e.	36	nw.	24	6	10	15.5
Philadelphia.....	117	168	184	29.83	29.95	+ .07	61.2	+ 0.8	91	30	70	40	8	53	31	55	50	7.33	+ 1.6	20	7,289	ne.	44	ne.	8	5	6	20.7
Atlantic City.....	32	68	76	29.90	29.96	+ .05	55.5	+ 1.7	76	20	61	42	9	50	35	53	52	5.17	+ 2.4	16	8,307	sw.	46	ne.	8	6	13	6.6
Cape May.....	34	52	70	29.94	29.96	+ .05	56.2	+ 2.4	72	31	60	42	9	52	20	53	52	3.92	+ 1.2	17	9,304	ne.	44	ne.	16	10	6	15.5
Baltimore.....	133	68	82	29.81	29.94	+ .08	63.9	+ 0.3	92	30	73	40	9	55	30	57	52	3.86	+ 0.1	12	4,235	se.	24	n.	8	5	13	6.4
Washington.....	112	59	76	29.83	29.95	+ .08	64.4	+ 0.5	91	30	74	36	9	55	34	58	55	3.60	+ 0.3	14	4,594	s.	25	n.	8	8	16	7.4
Cape Henry.....	5	34	54	29.83	29.95	+ .08	64.6	+ 0.1	93	20	72	43	10	57	42	60	56	5.17	+ 1.1	14	.....	ne.	34	nw.	5	13	10	8.2
Lynchburg.....	685	83	88	29.23	29.96	+ .05	67.4	+ 1.4	91	20	78	40	9	56	40	60	56	7.3	+ 0.8	15	3,144	ne.	34	nw.	5	13	10	8.2
Norfolk.....	57	88	93	29.90	29.96	+ .06	66.2	+ 0.2	92	2	75	43	10	57	35	61	59	5.12	+ 0.8	13	5,821	ne.	42	nw.	15	10	8	13.5
Richmond.....	144	98	105	29.90	29.96	+ .06	67.2	+ 1.9	92	30	77	40	9	58	34	61	59	5.28	+ 0.8	13	5,047	n.	26	n.	8	10	11	10.6
S. Atlantic States.																												
Charlotte.....	773	68	76	29.14	29.94	+ .08	71.9	+ 3.5	95	30	84	42	7	60	31	61	54	7.33	+ 2.3	11	5,019	s.	37	sw.	6	14	16	13.9
Hatteras.....	11	17	36	29.96	29.97	+ .06	66.0	+ 0.4	85	30	71	48	10	61	19	65	64	1.79	+ 2.8	12	9,074	s.	56	nw.	30	14	14	3.4
Kittyhawk.....	9	12	30	29.96	29.97	+ .06	65.0	+ 1.0	90	20	73	46	9	57	31	61	54	4.44	+ 0.7	10	9,074	s.	56	nw.	30	14	14	3.4
Raleigh.....	375	93	101	29.58	29.97	+ .05	70.0	+ 2.5	94	30	81	41	9	59	37	61	57	7.46	+ 1.8	12	4,715	sw.	31	n.	15	11	12	8.4
Wilmington.....	78	82	90	29.90	29.98	+ .04	71.6	+ 1.9	96	30	80	44	9	63	28	65	62	8.1	+ 2.5	1	6,846	sw.	38	w.	6	15	16	0.3
Charleston.....	48	14	92	29.97	30.02	+ .01	74.8	+ 2.4	98	30	82	50	8	68	36	66	62	7.1	+ 0.6	4	7,912	s.	34	n.	26	14	16	1.3
Columbia.....	180	69	103	29.78	29.96	+ .04	74.9	+ 2.9	101	30	88	44	8	62	34	64	57	6.0	+ 0.5	2	4,612	s.	41	w.	6	18	10	3.0
Augusta.....	82	63	89	29.91	29.99	+ .05	76.0	+ 3.1	101	30	86	48	8	69	29	66	61	7.8	+ 1.0	1	6,221	s.	30	w.	7	21	8	2.7
Jacksonville.....	43	69	84	29.96	30.01	+ .01	76.5	+ 1.6	97	30	87	52	8	66	27	68	66	7.8	+ 1.8	1	5,895	sw.	37	ne.	30	20	11	0.4
Florida Peninsula.																												
Jupiter.....	38	13	30	30.00	30.02	+ .00	75.8	+ 0.1	91	28	83	53	8	69	25	69	66	7.4	+ 1.5	4	7,138	e.	27	s.	6	24	5	2.3
Key West.....	22	43	50	30.02	30.04	+ .03	78.2	+ 1.2	86	18	82	60	8	74	12	71	68	7.2	+ 0.1	7	6,747	e.	28	nw.	7	25	4	2.6
Tampa.....	36	60	67	29.98	30.02	+ .00	76.6	+ 0.6	93	20	86	58	8	67	25	68	64	6.9	+ 0.3	3	5,250	w.	26	w.	8	27	3	1.5
East Gulf States.																												
Atlanta.....	1,131	92	136	28.81	29.98	+ .07	72.8	+ 4.0	94	30	84	38	7	62	29	61	53	5.5	+ 3.5	2	6,589	nw.	34	nw.	6	17	12	1.3
Pensacola.....	56	78	90	29.96	30.02	+ .00	74.8	+ 1.3	93	26	82	44	7	68	27	68	64	7.1	+ 0.4	3	6,861	sw.	39	nw.	6	18	12	1.5
Mobile.....	57	88	96	29.96	30.02	+ .01	74.8	+ 1.3	93	26	82	44	7	68	27	68	64	7.1	+ 0.4	3	6,861	sw.	39	nw.	6	18	12	1.5
Montgomery.....	221	100	112	29.75	29.98	+ .04	76.1	+ 3.2	96	30	88	43	7	64	34	65	58	5.0	+ 3.6	4	4,855	sw.	26	e.	14	23	8	0.2
Vicksburg.....	247	65	73	29.72	29.98	+ .02	74.4	+ 1.8	91	31	84	50	7	65	23	68	65	7.1	+ 1.3	7	5,042	sw.	30	nw.	6	19	10	2.5
New Orleans.....	54	112	130	29.96	30.02	+ .03	75.4	+ 0.8	95	25	84	53	7	67	22	67	63	7.1	+ 0.2	4	6,116	s.	33	n.	6	22	8	1.2
Port Eads.....	37	70	84	29.96	30.02	+ .03	74.4	+ 1.8	91	31	84	50	7	65	23	68	65	7.1	+ 1.3	7	5,042	sw.	30	nw.	6	19	10	2.5
West Gulf States.																												
Shreveport.....	349	77	84	29.68	29.95	+ .03	74.8	+ 1.7	94	30	85	47	7	64	31	66	62	6.9	+ 1.2	8	5,377	se.	30	se.	19	16	8	7.0
Fort Smith.....	481	63	72	29.40	29.90	+ .04	72.0	+ 3.8	91	28	82	48	7	62	29	65	61	7.1	+ 2.8	9	4,685	e.	40	n.	4	16	6	7.0
Little Rock.....	302	71	79	29.64	29.96	+ .02	73.0	+ 3.7	93	29	83	48	7	63	29	65	61	7.0	+ 1.8	9	5,503	s.	36	w.	19	12	14	5.9
Corpus Christi.....	30	42	50	29.90	29.92	+ .02	75.6	+ 0.2	85	31	80	58	7	72	16	72	70	8.4	+ 1.8	3	12,393	se.	37	se.	19	9	13	9.1
Galveston.....																												

TABLE I.—Climatological data for Weather Bureau Stations, May, 1898—Continued.

Stations.	Elevation of instruments			Pressure, in inches.			Temperature of the air, in degrees Fahrenheit.										Precipitation, in inches.			Wind.				Clear days.	Partly cloudy days.	Cloudy days.	Average cloudiness, tenths.	Total snowfall.		
	Barometer above sea level, feet.	Thermometers above ground.	Anemometers above ground.	Mean actual, 8 a. m. and 8 p. m. + 2.	Mean reduced.	Departure from normal.	Mean max. and min. + 2.	Departure from normal.	Maximum.	Date.	Mean minimum.	Date.	Mean minimum.	Greatest daily range.	Mean wet thermometer.	Mean temperature of the dew-point.	Mean relative humidity, per cent.	Total.	Departure from normal.	Days with .01, or more.	Total movement, miles.	Prevailing direction.	Maximum velocity.							
																							Miles per hour.						Direction.	Date.
<i>Up. Miss. Val.—Con</i>																														
Dubuque	608	101	100	29.17	29.92	-.04	59.8	-.01	83	24	69	37	6	50	31	53	47	66	4.47	+.05	14	5,436	ne.	28	se.	21	11	11	9	5.0
Keokuk	614	64	78	29.28	29.92	-.03	64.0	+.14	87	24	72	42	6	56	27	56	74	6.70	+.26	14	5,555	ne.	28	se.	21	18	7	14	10	
Cairo	359	87	93	29.55	29.94	-.02	69.3	+.23	82	24	78	42	6	60	26	64	62	5.36	+.15	13	6,306	se.	38	sw.	21	10	11	10	5.3	
Springfield, Ill.	644	82	92	29.25	29.93	-.06	62.6	+.02	86	24	72	40	4	54	27	57	53	5.12	+.01	19	6,830	s.	30	nw.	21	6	14	11	5.9	
Hannibal	534	75	107	29.34	29.94	-.02	63.9	+.08	89	24	73	42	4	55	30	50	50	6.90	+.21	18	6,825	sw.	37	s.	21	10	13	8	4.9	
St. Louis	567	111	210	29.34	29.94	-.02	67.1	+.13	90	24	76	41	6	58	27	60	56	8.55	+.40	16	7,063	s.	62	sw.	1	10	10	11	5.6	
<i>Missouri Valley.</i>																														
Columbia	4	84		29.92	29.93	-.01	64.7	+.06	89	24	75	39	6	54	36	50	50	8.39	+.25	19	6,116	e.	44	se.	30	8	12	11	5.9	
Kansas City	963	78	95	29.92	29.93	-.01	64.6	+.04	89	31	73	40	6	56	32	58	54	7.69	+.31	16	5,725	se.	40	s.	19	7	12	12	6.1	
Springfield, Mo.	1,324	100	103	28.54	29.92	-.04	66.1	+.29	85	25	75	39	6	57	35	59	55	8.06	+.20	13	7,509	se.	45	sw.	1	9	17	5	4.5	
Topeka	81			28.75	29.91	-.02	63.4	+.00	89	11	73	39	6	54	35	50	50	6.10	+.07	18		e.	42	se.	30	5	16	10		
Lincoln	1,199	74	84	28.63	29.90	-.07	60.4	+.07	85	24	70	37	6	51	31	53	49	4.33	+.01	12	8,121	ne.	42	se.	30	5	13	13	6.3	
Omaha	1,103	92	97	28.75	29.91	-.02	61.2	+.05	87	25	70	39	6	52	37	54	49	4.33	+.03	13	5,705	n.	38	se.	30	7	11	15	6.3	
Sioux City	1,139	96	164	28.40	29.94	+.05	59.5	+.11	86	25	68	35	6	51	35	50	44	4.69	+.13	13	8,826	nw.	53	sw.	17	6	8	17	6.9	
Pierre	1,460	50	62	28.40	29.94	+.05	56.4	+.08	89	23	67	33	6	46	36	50	44	3.55	+.12	14	7,176	e.	48	se.	17	10	5	16	6.4	
Huron	1,306	56	67	28.54	29.94	+.01	55.3	+.02	85	23	66	34	12	44	38	49	43	2.90	+.01	11	8,596	n.	54	se.	17	7	11	13	6.4	
Yankton	1,234	52	58				58.2	+.03	86	23	68	36	6	49	35			5.20	+.09	15	6,342	e.	38	s.	25	5	9	17	7.0	
<i>Northern Slope.</i>																														
Havre	2,494	46	47	27.30	29.90	-.01	52.0	+.13	76	10	63	29	2	41	37	44	36	1.06	+.05	8	8,831	e.	52	e.	28	10	15	6	5.0	
Miles City	2,372	41	49	27.42	29.90	-.01	55.5	+.09	87	23	66	30	4	45	38	48	40	2.61	+.04	10	6,340	e.	39	w.	24	4	14	13	6.4	
Helena	4,108	88	93	25.79	29.99	+.06	49.4	+.24	77	10	58	30	4	41	32	42	33	60	4.88	+.30	17	5,592	sw.	36	sw.	30	5	11	15	6.5
Rapid City	3,251	46	50	26.57	29.92	-.01	53.1	+.02	88	23	62	32	3	44	36	46	39	65	3.26	+.04	17	5,958	se.	36	w.	31	4	8	19	7.6
Cheyenne	6,105	58	60	23.95	29.95	+.03	47.4	+.32	79	23	57	24	1	38	38	40	32	64	3.72	+.15	20	8,381	nw.	51	s.	23	8	15	6.3	
Lander	5,372	28	36	24.58	29.96	+.04	48.2	+.20	76	22	58	24	6	38	38	42	34	66	6.02	+.33	14	3,470	nw.	30	w.	28	3	11	17	4.7
North Platte	2,826	43	52	27.03	29.95	+.03	55.7	+.25	84	23	65	30	6	46	38	50	46	76	4.12	+.14	20	7,511	nw.	49	w.	17	8	7	16	6.4
<i>Middle Slope.</i>																														
Denver	5,290	79	151	24.67	29.96	+.04	53.0	+.39	80	30	64	27	6	42	36	44	35	60	4.88	+.20	16	5,586	ne.	38	s.	23	5	13	13	6.5
Pueblo	4,713	74	81	25.20	29.90	+.02	56.4	+.23	86	30	68	32	4	44	42	46	37	60	3.59	+.18	13	6,129	se.	42	se.	24	8	15	8	5.5
Concordia	1,398	42	47	28.42	29.89	-.06	62.2	+.01	93	11	72	36	6	52	37	55	50	70	2.67	+.16	13	5,506	se.	34	w.	26	7	14	10	6.2
Dodge City	2,504	44	52	27.30	29.88	-.01	61.8	+.11	90	11	73	35	6	50	42	55	49	72	10.31	+.71	17	9,020	ne.	48	nw.	30	11	11	9	5.0
Wichita	1,351	78	85	28.48	29.89	-.01	65.0	+.08	88	31	75	40	6	56	32	58	54	72	8.32	+.43	14	6,772	s.	36	s.	18	11	8	12	5.5
Oklahoma	1,218	54	62	28.62	29.89	-.01	68.2	+.03	87	28	77	41	6	59	36	61	58	73	9.96	+.47	8	8,844	s.	40	se.	1	18	8	5	4.0
<i>Southern Slope.</i>																														
Abilene	1,749	45	54	28.09	29.88	-.04	73.2	+.10	101	28	84	43	6	63	31	62	55	62	2.60	+.10	3	9,217	se.	32	se.	1	13	13	5	3.9
Amarillo	3,691	54	61	26.16	29.87	-.04	63.6	+.06	93	28	77	32	6	51	38	52	40	55	3.52	+.15	14	13,635	s.	64	w.	8	15	10	6	2.6
<i>Southern Plateau.</i>																														
El Paso	3,767	10	110	26.09	29.83	-.02	70.9	+.14	96	23	85	48	11	57	41	49	22	21	0.01	+.05	1	9,666	nw.	46	sw.	30	21	9	1	2.3
Santa Fe	6,998	47	50	23.21	29.88	-.03	54.6	+.11	79	23	66	31	5	43	32	41	20	33	0.22	+.08	4	6,179	sw.	38	sw.	23	15	9	7	4.8
Phoenix	1,076	47	57	28.66	29.77	-.03	73.4	+.09	99	11	88	48	3	59	39	53	32	27	0.01	+.02	1	3,292	w.	18	sw.	27	24	6	1	1.6
Yuma	139	16	50	29.64	29.78	-.06	74.0	+.32	103	11	90	51	17	58	40	56	39	35	0.00	+.00	0	5,429	w.	32	nw.	23	27	2	2	1.6
Independence				25.85			62.1	+.02	84	10	74	41	*	50	30	46	23	28	0.23	+.01	4	7,963	nw.	38	w.	22	18	12	1	3.1
<i>Middle Plateau.</i>																														
Carson City	4,730	82	92	25.16	29.90		51.8	+.37	78	9	64	31	23	39	42	41	27	45	0.39	+.02	4	6,445	sw.	43	sw.	22	10	13	8	4.9
Winnemucca	4,340	59	70	25.54	29.90	-.03	52.2	+.22	79	*	65	30	20	39	40	45	39	68	1.59	+.06	10	7,167	sw.	36	sw.	21	6	11	14	6.4
Salt Lake City	4,344	83	90	25.54	29.93	.00	53.9	+.39	80	11	64	32	4	44	35	45	36	56	4.19	+.25	14	4,539	se.	37	sw.	12	4	7	20	7.6
<i>Northern Plateau.</i>																														
Baker City	3,470	49	55	26.35	29.92	-.03	50.6	+.21	79	9	62	30	31	39	41	41	29	51	2.17	+.03	11	4,944	nw.	29	nw.	3	8	11	12	6.0
Idaho Falls	4,742	10	56	25.13	29.91	-.02	50.8	+.15	78	10	63	28	5	38	41	43	36	65	1.74	+.06	11	8,565	s.	44	sw.	28	7	6	18	6.4
Spokane	1,943	99	107	27.88	29.92	-.03	55.1	+.19	83	25	67	34	7	43	38	45	33	48	1.63	+.02	6	5,405	s.	24	s.	17	14	8	9	4.7
Walla Walla	1,018	65	73	28.85	29.93	-.01	58.4	+.25	84	25	71	38	4	46	36	50	42	60	2.26	+.0										

TABLE II.—Meteorological record of voluntary and other cooperating observers, May, 1898.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
<i>Alabama.</i>	°	°	°	Ins.	Ins.
Alecot.....	96	42	74.2	0.59	
Ashville.....	98	39	73.0	0.48	
Bermuda.....	98	42	75.1	0.33	
Birmingham.....	99	40	74.0	0.11	
Bridgeport.....				1.13	
Citronelle.....	95	46	76.4	0.00	
Clanton.....	95	42	72.9	0.10	
Daphne.....	93	48	73.8	0.15	
Decatur.....	96	37	73.2	1.29	
Demopolis.....				0.10	
Elba.....	95	41	74.1	2.07	
Eufaula.....	101	42	75.0	0.49	
Evergreen.....	92	45	72.8	0.25	
Florence.....				2.07	
Florence.....	90	43	72.1	2.22	
Fort Deposit.....	97	43	73.0	0.60	
Gadsden.....	97	37	72.5	0.04	
Goodwater.....	100	52	76.8	0.16	
Greensboro.....	95	42	75.0	1.88	
Hamilton.....				1.94	
Healing Springs.....	97	41	72.3	1.02	
Highland Home.....	93	41	75.2	1.77	
Jasper.....	95	35	69.3	0.27	
Livingston.....	99	47	77.2	0.07	
Lock No. 4.....	95	39	72.0	1.49	
Madison Station.....	92	36	70.4	1.39	
Marion.....	97	40	75.0	0.50	
Mount Willing.....	96	41	75.8	0.97	
Newbern.....	97	41	76.2	0.22	
Newburg.....	95	40	71.4	1.65	
Newton.....	95	41	73.4	0.26	
Oneonta.....	92	38	70.6	0.20	
Opelika.....	98	39	75.2	0.11	
Oxanna.....	93	37	69.4	1.12	
Pineapple.....	96	38	74.4	0.43	
Pushmataha.....	97	44	76.4	0.40	
Riverton.....	93	40	71.2	3.05	
Scottsboro.....	92	37	69.8	0.32	
Selma.....	98	43	75.8	0.38	
Sturdevant.....				0.79	
Talladega.....	97	41	73.4	0.30	
Tallapoosa.....				0.25	
Thomasville.....	98	43	77.2	0.35	
Tuscaloosa.....	99	40	75.8	0.19	
Tusculum.....	92	44	72.8	2.44	
Union.....	98			0.18	
Union Springs.....	99	41	76.2	1.18	
Uniontown.....	96	43	77.0	1.10	
Valleyhead.....	94	33	70.4	1.55	
Warrior.....				0.60	
Wetumpka.....	98	41	75.2	0.62	
Wilsonville.....				0.00	
<i>Arizona.</i>					
Arizona Canal Co. Dam.	102	49	74.2	T.	
Benson.....	94	64	74.5	T.	
Bisbee.....	88	42	65.5	0.00	
Buckeye.....	100	44	71.6	0.51	
Camp Creek.....	91	45	67.4	0.00	
Casa Grande.....	89	62	76.0	0.00	
Champer Camp.....	101	49	73.6	0.05	
Congress.....	92	46	69.6	0.07	
Dragoon Summit.....	90	50	66.8	0.00	
Dudleyville.....	97	42	67.7	0.05	
Flagstaff.....	83	25	51.8	4.90	
Fort Apache.....	87	34	59.0	2.70	
Fort Defiance.....	79	36	52.2	0.28	
Fort Grant.....	90	40	65.3	0.00	
Fort Huachuca.....	90	32	65.2	0.12	
Fort Mohave.....	106	52	77.2	0.00	
Gilabend.....	100	60	77.9	0.00	
Holbrook.....	94	28	59.4	0.26	
Jerome.....	88	40	63.6	1.10	
Mariop.....	96	62	80.4	0.00	
Mesa.....	97	47	72.4	T.	
Mount Huachuca.....	89	37	64.6	0.00	
Muske Mountain.....	96	40	67.4	0.82	
Natural Bridge.....				0.98	
Oracle.....	88	39	64.7	0.40	
Oro.....				0.06	
Oro Blanco.....	94	39	65.4	0.02	
Pantano.....	90	55	71.5	0.00	
Parker.....	109	45	73.8	0.15	
Peoria.....	97	50	74.0	T.	
Phoenix.....	97	43	71.6	0.00	
Pinal Ranch.....				0.14	
Prescott.....	90	38	68.8	0.92	
St. Helena Ranch.....				0.00	
San Carlos.....	101	41	69.0	0.00	
San Simon.....	98	47	70.4	0.00	
Showlow.....				0.00	
Signal.....	98	46	72.5	0.70	
Snowflake.....	85	29	56.4	0.22	
Strawberry.....	82	29	53.4	1.41	
Sulphur Spring Valley.....				T.	
Texas Hill.....	107	62	80.3	0.00	
Tombstone.....	91	44	67.4	0.00	
<i>Arizona—Cont'd.</i>					
Tuba.....	88	32	59.6	0.75	
Tucson.....		45		0.00	
White Hills.....	96	42	68.6	0.95	
Willcox.....	90	38	67.3	0.00	
<i>Arkansas.</i>					
Amity.....	90	42	71.6	4.96	
Arkansas City.....				4.37	
Beebranch.....	92	40	69.5	3.65	
Blanchard Springs.....	95	39	73.6	2.97	
Brinkley.....	90	46	72.2	5.60	
Camden.....				3.69	
Camden.....	94	44	74.6	3.75	
Canter.....	90	44	70.0		
Conway.....	96	44	74.3	9.80	
Corning.....	90	43	71.0	7.21	
Dallas.....	91	41	71.8	14.28	
Dardanelle.....				8.51	
Elton.....	95	40	73.3	1.22	
Fayetteville.....	90	40	68.4	10.42	
Forrest.....	91	43	72.8	2.80	
Fulton.....				4.04	
Hardy.....	90	43	69.7	8.40	
Jasper.....				5.88	
Helena.....	95	46	74.0	4.85	
Hot Springs.....	94	40	73.1	8.63	
Hot Springs.....				7.38	
Jonesboro.....	92	43	71.6	4.65	
Keesee Ferry.....	94	41	70.5	8.14	
Lacrosse.....	91	44	70.4	8.32	
Lonoke.....	96	48	74.2	4.87	
Lutherville.....	100	44	73.4		
Malvern.....	94	43	73.0	4.19	
Marianna.....	93	53	75.4		
Marvell.....	94	46	74.4	4.36	
Mena.....	88	47	71.8	13.89	
Moore.....				9.80	
Mossville.....	88	42	67.8	11.33	
Mount Nebo.....	86	45	69.6	8.91	
New Gascony.....	92	48	74.8	3.27	
Newport.....				6.04	
Newport.....	94	40	73.0	5.29	
Newport.....	95	45	72.6	5.32	
Oregon.....	92	40	66.2		
Oseola.....	94	45	73.9	3.68	
Ozark.....	96	46	73.1	6.91	
Picayune.....	96	38	71.9	5.50	
Pinebluff.....	97	44	75.4	3.12	
Pond.....	87			11.68	
Prescott.....	97	43	75.2	3.41	
Rison.....	98	42	73.2	4.18	
Russellville.....	96	45	72.6	8.16	
Silver Springs.....	91	41	68.8	9.49	
Spierville.....	96	45	72.3	11.05	
Stamps.....	92	40	73.3	2.78	
Stuttgart.....	94	45	74.4	4.93	
Texas.....	98	50	75.3	3.11	
Warren.....	92	44	73.2	4.95	
Washington.....	94	45	74.4	3.64	
Wicks.....	90	45	73.6	6.49	
Winslow.....	87	41	67.8	9.81	
Witts Springs.....	89	40	67.8	10.61	
<i>California.</i>					
Agnew.....	80	34	55.7	0.71	
Asi.....	89	42	60.5		
Ballast Point L. H.....				0.22	
Bar Valley.....				3.93	
Berkeley.....	68	45	55.2	1.87	
Bishop.....	84	43	59.8	0.27	
Blue Lakes City.....	94	37	61.7	2.22	
Boca.....	76	26	45.9	0.85	
Bodie.....	75	14	40.3	1.08	
Bowmans Dam.....	70	33	47.3	3.95	
Caliente.....	97	50	66.1	1.40	
Campbell.....	80	36	56.4	0.38	
Cape Mendocino L. H.....				4.20	
Cedarville.....	80	32	51.1	1.51	
Centerville.....	84	51	59.4	1.28	
Chico.....	98	52	65.6	1.63	
Chino.....				1.70	
Cisco.....	69	28	40.7	3.40	
Claremont.....	90	41	60.5	1.85	
Corning.....	95	50	63.5	1.28	
Crescent City.....	68	34	51.0	3.83	
Crescent City L. H.....				3.90	
Delano.....	93	50	67.5	0.25	
Delta.....	86	43	62.5	5.85	
Descanso.....				2.35	
Drytown.....	89	39	58.6	1.79	
Dunnigan.....	91	45	64.3	1.67	
Durham.....	87	40	62.9	1.58	
East Brother L. H.....				0.95	
Edmonton.....	79	33	48.6	4.94	
Elsinore.....	96	40	64.7	1.32	
Escondido.....	87	38	61.4	1.19	
Fallbrook.....				2.23	
Folsom City.....	98	52	64.7	1.35	
<i>California—Cont'd.</i>					
Forde Dam.....					3.83
Fort Bragg.....					4.03
Fort Ross.....	68	40	52.1	7.61	
Georgetown.....	81	36	54.9	2.78	
Goshen.....	96	45	69.4	0.55	
Grand Island.....	94	45	65.7	1.20	
Grass Valley.....				2.76	
Greenville.....	86	29	51.0	3.07	
Healdsburg.....	75	39	55.4	4.07	
Hill Ranch.....	98	38	60.1	0.90	
Hollister.....	81	38	56.1	0.60	
Humboldt L. H.....				2.47	
Indio.....	102	56	75.8	0.00	
Iowa Hill.....	81	40	56.2	2.83	
Jackson.....	84	38	56.7	1.64	
Jolon.....				0.52	
Keene.....	88	43	58.2	1.12	
Kennedy Gold Mine.....	88	37	58.4	2.34	
King City.....	74	38	50.2	0.24	
Kingsburg.....	95	50	71.6	0.55	
Kono Taye.....	82	45	60.5	1.67	
Lagrange.....	100	48	66.7	1.41	
Laporte.....	71	33	46.5	4.64	
Las Fuentes Ranch.....				1.22	
Lemoore.....	95	50	67.5	0.00	
Lick Observatory.....	73	33	47.9	2.41	
Lime Point L. H.....				1.85	
Lodi.....	89	43	61.8	1.38	
Los Gatos.....	77	41	54.6	1.25	
Lytton Springs.....	83	45	59.6		
Malakoff Mine.....	83	35	54.9	4.47	
Mammoth Tank.....	108	60	80.6	0.00	
Manzana.....	87	30	55.4	0.25	
Mare Island L. H.....				1.35	
Merced.....	95	50	61.0	0.98	
Mills College.....				1.45	
Milo.....				2.05	
Milton (near).....	92	49	62.8	1.41	
Modesto.....	95	50	65.6	0.57	
Mokelumne Hill.....				2.13	
Monterey.....	64	49	54.5	0.94	
Mountain View.....				0.27	
Mount Tamalpais.....	73	32	50.5	4.84	
Napa.....	79	39	56.9	1.64	
Needles.....	101	56	77.6	0.11	
Nevada City.....	80	34	52.9	2.73	
Newhall.....	96	44	60.8	0.93	
North Ontario.....	86	40	57.4	2.75	
North San Juan.....	84	42	57.5	4.16	
Oakland.....	75	45	56.0	1.50	
Ogden.....	105	65	82.5	0.00	
Oleta.....	84	45	56.0	1.96	
Oroville.....	98	52	70.4	1.65	
Palermo.....	94	42	65.0	1.75	
Paso Robles.....	96	36	59.2	0.68	
Peachland.....	77	45	57.4	3.87	
Pedras Blancas L. H.....				1.33	
Pigeon Point L. H.....				0.55	
Pilot Creek.....				2.90	
Pine Crest.....	81	44	58.2	1.09	
Placerville.....	83	36	55.5	2.70	
Point Ano Nuevo L. H.....				0.54	

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
California—Cont'd.						Colorado—Cont'd.						Georgia—Cont'd.					
Saticoy.....	83	43	59.3	0.97	Ins.	Wagon Wheel.....	65	19	39.5	1.50	15.0	Crescent.....	102	45	73.4	0.78	Ins.
Shasta.....	83	43	59.3	2.42	7.0	Walden.....	75	15	43.2	2.08	5.5	Dahlonega†.....	91	36	68.0	1.00	
Sierra Madre.....	78	16	44.2	0.54		Waller.....	88	28	56.3	7.65		Diamond.....	98	35	66.6	1.22	
Sneddens Ranch*1.....	78	42	57.8	1.68		Wray†.....	82	34	55.0	5.47	5.0	Eastman.....	98	45	74.8	0.67	
Sonoma*5.....	79	41	56.8	0.48		Yuma.....	82	33	55.8	5.80	6.0	Elberton†.....	98	40	74.4	3.66	
S. E. Farallone L. H.....	85	40	60.5	1.11		Connecticut.						Fitzgerald.....	100	45	76.8	1.03	
Stanford University.....	74	29	46.7	3.18		Canton†.....	82	34	55.0	6.74		Fleming†.....	102	47	76.0	1.10	
Stockton.....	78	32	52.5	0.54		Colchester.....	82	33	55.8	6.16	0.2	Fort Gaines.....	96	46	76.0	0.80	
Summerdale†.....	82	35	54.0	1.85		Falls Village.....	82	34	55.8	6.35		Franklin.....	94	43	72.7	0.10	
Susanville†.....	92	54	67.4	0.98		Greenfield Hill.....	82	34	55.8	9.44	T.	Gainesville.....	91	39	69.3	1.03	
Sutter Creek*5.....	85	44	68.1	0.77		Hartford.....	82	36	56.0	5.62		Gillsville†.....	96	39	72.4	1.03	
Tehama*1.....	78	30	46.2	0.30		Hawleyville.....	82	36	56.0	5.96	T.	Greenbush.....	93	37	69.2	0.50	
Templeton*1.....	104	42	67.0	0.56		Lake Konomoc.....	85	33	57.1	6.92		Griffin.....	101	39	74.9	1.10	
Trinidad L. H.....	93	45	67.4	0.94		Middletown.....	79	34	53.0	9.14	T.	Hephzibah.....	102	47	76.0	0.70	
Truckee*1.....	83	37	56.2	1.63		New London†.....	86	32	55.8	8.01		Jesup.....	97	40	74.6	1.83	
Tulare.....	88	35	57.5	1.90		North Franklin.....	81	28	53.1	8.12		Lagrange†.....	102	39	74.6	0.22	
Upper Mattole.....	90	51	62.0	1.94		Norwalk.....	81	32	55.8	6.23		Leverett.....	99	44	75.6	0.57	
Vacaville*1.....	80	36	54.3	1.40		Pomfret.....	80	40	56.4	3.02		Louisville.....	96	42	76.9	1.43	
Ventura.....	96	40	63.3	0.73		Southampton.....	81	32	55.8	3.83		Lumpkin.....	99	43	75.6	0.47	
Visalia.....	109	69	88.4	0.00		South Manchester.....	81	32	55.8	3.74	T.	Macon.....	92	38	68.7	0.63	
Volcano Springs*1.....	86	46	61.8	1.12		Storrs.....	81	33	54.0	5.56		Marietta.....	96	46	76.0	0.45	
Walnut Creek.....	92	41	60.5	0.21		Voluntown†.....	84	29	55.6	3.81		Marshallville†.....	99	46	76.0	1.19	
West Palmdale*1.....	91	52	64.9	0.90		Waterbury.....	83	32	55.7	5.53		Mauzy.....	102	45	76.2	0.98	
Westpoint.....	79	52	62.6	0.95		West Cornwall†.....	78	36	54.5	6.45		Millen.....	98	41	73.6	2.85	
Williams*1.....	88	47	62.6	2.06		West Simsbury.....	78	42	54.4	6.86		Morgan†.....	98	39	75.0	0.83	
Wilmington*5.....	87	29	55.3	2.06		Winsted*1.....	90	39	61.6	6.18		Newman.....	97	51	76.4	0.25	
Wire Bridge*5.....	82	28	51.9	3.76		Delaware.						Piscataway.....	100	40	72.8	0.17	
Yerba Buena L. H.....	82	28	51.9	3.76		Dover.....	96	42	62.4	5.37		Poulton†.....	100	43	75.0	0.29	
Yreka†.....	82	28	51.9	3.76		Milford.....	92	38	61.6	4.45		Quitman†.....	99	49	76.4	1.18	
Colorado.						Millsboro.....	89	37	60.7	3.83		Ramsey.....	94	35	70.8	0.16	
Altman.....	82	28	51.9	3.76		Newark.....	90	40	62.4	5.72		Rome†.....	95	40	71.2	0.98	
Antlers†.....	82	28	51.9	3.76		Seaford.....	90	40	62.4	4.63		Talbotton†.....	96	41	74.3	1.45	
Arkins.....	82	28	51.9	3.76		District of Columbia.						Tallapoosa.....	94	44	71.8	0.45	
Boulder.....	82	28	51.9	3.76		Distributing Reservoir*5.....	87	44	65.6	1.66		Thomasville†.....	97	48	77.0	2.18	
Boxelder.....	82	28	51.9	3.76		Receiving Reservoir*5.....	92	41	65.5	3.35		Toccoa†.....	95	40	71.3	1.18	
Breckenridge†.....	70	13	38.2	0.46	1.8	West Washington.....	92	34	64.8	3.38		Union Point.....	97	35	71.0	0.29	
Canyon†.....	87	32	55.6	2.89	1.0	Florida.	97	53	77.2	3.87		Washington†.....	99	42	74.8	0.89	
Castlerock.....	86	23	54.4	6.48	13.5	Archert.....	97	53	77.2	2.58		Waycross.....	98	50	75.9	1.00	
Cedaredge.....	82	24	52.6	2.79		Bartow.....	98	46	78.1	1.66		Waynesboro.....	98	40	73.8	2.71	
Cheyenne Wells.....	89	30	55.4	5.84	4.0	Boca Raton†.....	90	50	75.4	2.58		West Point.....	96	41	74.8	0.30	
Colbran.....	78	28	50.5	3.32		Brooksville†.....	96	55	77.8	2.46		Idaho.					
Colorado Springs†.....	87	32	54.8	4.88		Carrabelle†.....	91	45	74.9	0.68		Albany Falls.....	79	31	51.8	3.52	
Crook.....	89	30	58.2	0.88		Clermont†.....	99	52	78.8	1.10		American Falls.....	82	31	52.2	2.83	
Delta.....	76	29	51.9	1.33		De Funiak Springs.....	97	42	74.3	1.29		Blackfoot†.....	82	24	53.8	2.83	
Dumont†.....	82	28	51.9	3.76		Earneville.....	99	53	79.1	0.31		Boise Barracks.....	92	29	56.7	2.92	
Durango.....	82	28	51.9	3.76		Estero*1.....	89	59	75.8	1.75		Burnside†.....	74	24	47.5	2.92	
Fleming.....	82	28	51.9	3.76		Eustis†.....	98	56	78.2	1.92		Challis.....	83	27	56.3	0.72	
Fort Collins†.....	82	28	51.9	3.76		Federal Point†.....	94	52	74.6	1.92		Coeur d'Alene.....	84	34	57.6	3.33	
Fort Morgan.....	82	28	51.9	3.76		Fort Meade.....	98	45	76.8	1.17		Corral*1.....	78	32	49.8	3.33	
Garnett.....	82	28	51.9	3.76		Gainesville.....	98	52	76.8	0.73		Dorney.....	78	28	49.0	3.64	
Georgetown.....	82	28	51.9	3.76		Grasmere†.....	98	47	77.5	2.06		Fort Sherman†.....	84	31	53.6	2.65	
Gleneyrie†.....	82	28	51.9	3.76		Haywood.....	97	47	77.5	2.46		Gilmet†.....	77	21	49.7	5.36	4.0
Grand Junction†.....	82	28	51.9	3.76		Homeland.....	97	48	78.4	2.58		Gray.....	75	21	45.2	4.00	
Greeley.....	82	28	51.9	3.76		Huntington.....	97	53	78.2	2.58		Kootenai†.....	90	31	58.4	2.97	
Gulch.....	82	28	51.9	3.76		Kissimmee.....	97	53	78.2	2.58		Lake.....	79	30	41.8	1.07	7.0
Hamps.....	82	28	51.9	3.76		Lake Butler.....	98	55	77.6	6.16		Lakeview.....	78	35	52.6	3.25	
Hoehne.....	82	28	51.9	3.76		Lake City†.....	98	56	76.6	0.35		Lewiston.....	86	36	58.8	2.06	
Holly.....	82	28	51.9	3.76		Lakemont.....	99	48	76.9	1.55		Lost River.....	78	23	49.8	2.06	
Holyoke.....	82	28	51.9	3.76		Lemon City.....	102	53	79.4	1.47		Marysville.....	74	21	48.6	0.29	
Holyoke (near).....	82	28	51.9	3.76		Macclenny†.....	91	52	76.0	1.65		Minidoka.....	78	28	50.4	2.09	
Hugo.....	82	28	51.9	3.76		Manatee.....	99	50	75.6	1.86		Moscow.....	78	28	50.2	3.82	
Husted†.....	82	28	51.9	3.76		Merritts Island.....	96	56	76.0	2.08		Murray†.....	78	27	50.9	4.82	
Lake Moraine†.....	82	28	51.9	3.76		Myers†.....	96	56	76.7	0.73		Nampa.....	87	36	56.6	1.10	
Lamar†.....	82	28	51.9	3.76		New Smyrna.....	92	50	75.6	3.53		New Plymouth.....	90	31	60.2	1.99	
Laporte.....	82	28	51.9	3.76		Ocala†.....	94	48	72.2	1.17		Oakley.....	85	27	52.2	1.10	
Las Animas†.....	82	28	51.9	3.76		Orange City.....	97	48	76.9	2.88		Ola†.....	86	27	54.7	2.31	
Leadville (near)*1.....	82	28	51.9	3.76		Orange Park.....	98	56	77.7	0.41		Paris.....	78	27	54.7	2.31	
Leroy†.....	82	28	51.9	3.76		Orlando†.....	97	53	76.6	1.57		Pollock†.....	91	32	56.6	3.02	
Longs Peak.....	82	28	51.9	3.76		Plant City.....	97	53	77.1	1.19		Rexburg.....	77	36	50.7	1.39	
Meeker.....	82	28	51.9	3.76		St. Andrews.....	96	49	76.2	0.72		St. Maries.....	83	31	54.0	2.64	
Millbrook.....	82	28	51.9	3.76		St. Francis.....	92	48	75.6	1.50		Salubria†.....	88	36			

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.			
Stations.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.	Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.	Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.	Stations.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.	
Illinois—Cont'd.																									
Decatur†	87	38	62.7	5.74	Ins.	Marion†	83	38	61.6	8.45	Ins.	Lamoni†	90	35	61.3	6.15	Ins.	Lansing†	89	36	61.3	2.38	Ins.		
Dixon†	84	37	59.5	4.00		Markle†	82	38	61.2	6.40		Larchwood†				5.38		Larrabee†	89	31	56.4	3.54			
Dwight†	86	35	60.1	6.12		Mauzy†	86	37	62.4	3.25		Leclaire†				3.78		Leclaire†				3.78			
East Peoria†	87	34	61.7	7.39		Michigan City* ¹	78	39	55.5		4.64	Lemars†	87	31	58.0	3.71		Lenox†	84	36	60.2	4.97			
Effingham†	87	40	64.5	3.94		Mount Vernon†	92	39	68.3		4.64	Logan†	90	35	60.2	4.91		Maple Valley†				4.97			
Elgin†	79	35	58.1	4.24		Northfield†	82	38	61.4	4.76		Maquoketa†	84	34	59.3	3.64		Marshall†	88	35	59.5	4.26			
Equality†	93	40	69.2	6.07		Paoli†	89	33	66.2	4.66	4.0	Mason City†	84	32	57.8	5.30		Millman†				5.54			
Friendgrove†				6.15		Princeton* ¹	89	40	65.1	4.60		Monticello†	85	30	59.8	3.46		Moore†	88	38	61.4	6.87			
Galva†	83	37	60.0	8.74		Richmond†	85	37	62.1	3.12		Mount Pleasant* ¹	84	42	62.7	5.50		Mount Vernon* ¹	87	37	60.9	4.43			
Glenwood* ¹	78	40	59.3	3.66		Rockport†	87	37	68.8	4.65		Mount Vernon* ²	85	35	59.4	4.50		New Hampton†	82	35	60.1	3.41			
Golconda†	90	38	68.2	5.17		Rockville†	84	41	62.6	3.54		Newton†	89	36	60.7	4.04		North McGregor†				2.44			
Grafton†				9.08		Salem†				3.57		Northwood†	83	34	57.2	3.95		Odebolt†	92	32	59.7	4.79			
Greenville†	90	39	65.8	6.51		Scottsburg†	88	34	66.7	4.90		Oden†	87	33	59.2	4.73		Olin†	83	33	58.9	4.70			
Griggsville†	89	40	63.4	8.30		Seymour†	84	40	63.8	3.87		Osage* ²				3.67		Oscola†	85	35	60.0	5.30			
Halliday* ²	87	40	71.1	9.44		Shelbyville†				2.50		Oskaloosa†	88	35	60.1	3.10		Ottumwa†	88	36	61.0	7.80			
Havana†	84	43	63.4	7.93		South Bend†	81	33	59.8	2.97		Ottumwa†	88	36	61.0	7.80		Ovid†	80	32	60.5	4.23			
Henry†				6.41		Syracuse†				4.79		Pella†	84	34	60.0	4.00		Plover†	90	35	59.2	4.85			
Hillsboro†	87	40	64.2	7.46		Terre Haute†	83	43	64.9	2.23		Pringhar†	88	35	59.0	4.49		Red Oak†	90	33	61.1	3.79			
Joliet†	80	36	59.2	3.82		Topeka†	79	34	59.4	3.31		Rock Rapids†	86	36	55.0	6.05		Ridgway†	84	32	59.4	3.30			
Kankakee†				5.66		Valparaiso†	82	34	59.1	3.60		Rockwell City†	89	32	58.9	5.29		Ruthven†	86	30	57.2	4.70			
Knoxville†	84	39	60.2	7.98		Vevay†	80	35	67.6	4.60		Sac City†	85	36	58.6	4.63		Sibley†	88	38	56.5	5.42			
Lagrange†	81	36	57.4	3.50		Vincennes†	90	38	63.8	4.21		Sidney†	85	38	60.6	3.94		Sigourney†				2.64			
Laharpe†	89	39	63.0	8.56		Warsaw†	79	36	57.9	4.95		Spencer†	89	30	57.4	5.00		Spirit Lake†	88	32	57.3	3.28			
Lanark†	83	30	58.8	3.87		Washington†	88	40	66.2	4.48		Stuart†	89	32	59.2	4.91		Tara†	89	33	58.8	5.10			
Leamington†				6.00		Winamac†	88	37	62.4	5.19		Thurman†	87	36	61.0	5.01		Toledo†	88	32	60.0	3.58			
McLeansboro†	88	40	67.7	6.05		Worthington†	88	41	65.2	2.58		Waterloo†	86	33	59.4	4.22		Villisca†	87	33	60.1	4.52			
Martinsville†	86	41	64.0	2.79		Indian Territory.						Vinton* ¹	85	39	60.0	3.02		Washington†	88	33	58.7	4.59			
Martinton†	82	38	60.1	5.66		Healdton†	89	40	69.7	4.85		Washta†				4.29		Waterloo†	86	33	59.4	4.22			
Mascoutah†	89	40	65.4	6.84		Kemp†	101	39	74.0	2.90		Waverly†	84	34	59.7	5.18		Webster City†	86	35	59.9	4.00			
Mattoon†	88	40	64.2	4.96		Lehigh†	96	42	70.9	4.60		Webster City†	86	35	59.9	4.00		West Bend* ¹	86	39	58.2	4.85			
Minonk†	83	34	59.4	6.84		Purcell†	92	41	69.0	9.89		West Branch†	83	32	57.4	3.30		Whitten* ¹	87	38	55.8	4.40			
Monmouth†	88	38	60.8	6.60		South McAlester†				10.23		Wilton Junction†	85	34	60.0	4.51		Winterset†	88	34	60.1	4.62			
Morrisonville†	85	38	61.8	9.14		Tahlequah†	92	38	66.9	11.46		Kansas.						Abilene†	89	36	64.3	6.20			
Mount Carmel†				5.82		Tulsa†				8.40		Achilles†				4.23		Altoona* ²	90	42	65.6	5.74			
Mount Pulaski†	89	38	63.3	5.04		Wagoner†	93	42	70.4	12.16		Anthony†				10.33		Atchison†	89	39	62.7	10.32			
Mount Vernon†				5.86		Iowa.						Augusta†	90	40	66.1	9.20		Baker†	90	37	61.6	5.64			
New Burnside†	90	38	67.8	7.28		Adair†				6.74		Beloit†	92	32	62.6	3.85		Burlington†	90	40	65.7	6.67			
Ottawa†	84	35	60.9	6.72		Afton†	90	37	61.4	4.25		Campbell†	92	34	62.4	4.36		Chanute†	90	41	66.6	6.69			
Palestine†	89	42	63.9	3.15		Algona* ¹	87	40	59.4	6.09		Colby†	91	30	56.9	4.51		Columbus†	89	39	66.8	6.05			
Pana†	87	39	63.7	6.49		Alta* ²	89	34	58.5	4.86		Coolidge†	82	29	58.2	6.13		Cunningham†	94	34	64.8	6.85			
Paris†	85	41	62.9	3.05		Amana†	86	35	60.4	4.14		Delphos†	95	33	62.4	2.62		Dresden†	90	32	58.2	5.01			
Peoria†				6.56		Ames* ³	90	35	59.5	3.88		Ellinwood†	91	34	62.1	4.41		Emporia†	84	40	63.2	7.24			
Peoria* ¹	85	40	61.9	5.54		Ames (near)†				2.80		Englewood†	94	34	64.8	4.83		Esbridge†	88	40	62.8	7.45			
Philo†	84	37	61.2	4.93		Atlantic†	90	30	58.0	4.61		Eureka†				8.74		Eureka Ranch†	92	33	60.0	5.25			
Plumhill†	84	39	64.4	5.12		Audubon†	85	36	58.5	4.99		Fallriver†	89	40	66.4	6.04		Fanning†				8.50			
Rantoul†	84	38	60.9	5.94		Belknap†	86	38	61.4	5.78		Fort Riley†	88	37	63.4	6.88		Fort Scott†	89	40	67.6	7.41			
Reynolds†	83	37	60.0	5.44		Bellevue†	85			5.43		Frankfort†	91	35	62.2	5.17		Garden City†	92	31	61.1	6.49			
Riley†	81	33	58.3	2.74		Belleplaine†	85			5.43		Garfield†				6.27		Gibson†	92	30	59.3	5.50			
Rockford†	79	34	57.8	4.36		Bonaparte†	88	37	61.0	6.11		Globe* ¹				6.65		Glenola†	90	40	66.3	6.22			
Round Grove†	87	37	61.0	4.19		Britt†	88	30	58.4	4.43		Halstead†	88	38	62.4	5.48									
St. Charles* ¹	79	38	57.4	4.07		Burlington†	87	40	63.0	5.36															
St. John†	90	41	68.7	6.06		Carroll†	88	34	58.0	4.72															
Scales Mound†	83	30	57.6	4.07		Cedar Falls†	86	37	61.0	7.15															
Streamort†	81	36	60.8	6.00		Cedar Rapids†	85	37	60.8	3.41															
Sycamore†	79	34	59.8	3.30		Centerville†	87	36	61.2	4.44															
Tilden†	87	39	60.6	5.93		Chariton†	84	36	61.1	5.17															
Tiskilwa†	84	32	59.8	7.30		Charles City†	82	33	57.8	4.58															
Tuscola†	83	39	61.4	5.71		Clarinda†	88	40	62.2	5.15															

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.							
Stations.						Stations.		Stations.						Stations.		Stations.						Stations.							
Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		
Kansas—Cont'd.						Louisiana—Cont'd.						Massachusetts—Cont'd.																	
Hays	91	32	59.2	10.42	Ins.	Covington	95	44	74.5	0.94	Ins.	Attleboro	81	30	55.4	4.31													
Horton	87	37	62.4	6.74		Donaldsonville	96	47	75.9	0.43		Bedford	81	30	55.4	2.94													
Hoxie	90	32	58.4	5.49		Elm Hall	93	47	73.1	0.40		Bluehill (summit)	81	37	54.0	4.12	T.												
Hutchinson	89	37	64.4	3.88		Emille	93	44	73.6	T.		Cambridge a	83	31	56.2	3.73													
Independence	94	41	68.6	5.28		Farmerville	92	43	74.0	1.51		Chestnut Hill	82	32	56.4	4.45													
Lawrence	88	40	65.0	7.42		Franklin	96	48	76.5	0.09		Cohasset				4.62													
Lebanon	91			3.40		Grand Coteau	90	48	74.8	1.58		Concord	82	27	55.0	2.81													
Lebo	90	40	64.6	7.54		Houma	95	46	77.0	1.65		Dudley	77	35	55.9	2.65													
Linn				4.22		Jeanerette	96	42	75.0	0.67		East Templeton *1	76	37	54.0	2.77													
Macksville	90	34	60.2	4.30		Jennings	96	40	73.0	T.		Fallriver	82	37	56.0	4.96												0.5	
McPherson	90	36	63.2	6.34		Lafayette	96	44	75.0	1.56		Fiskdale				2.96													
Manhattan b	90	37	63.8	8.54		Lake Charles†	94	46	73.8	0.17		Fitchburg a *1	78	40	55.0	4.11													
Manhattan c	90	37	63.7	8.04		Lawrence	97	49	79.4	0.15		Fitchburg b	81	33	55.1	3.36													
Marion†	89	37	67.0	6.75		Liberty Hill	98	42	75.0	2.79		Framingham	83	30	57.3	3.06													
Meade†	95	35	65.2	4.51		Mansfield	91	42	73.4	4.38		Groton	81	28	54.7	3.54													
Medicine Lodge†	92	37	67.0	6.44		Melville	91			0.50		Hyannis *†1	75	36	52.6	6.41													
Minneapolis†	92	34	62.8	3.03		Minden	98	43	74.6	2.15		Jefferson				3.32													
Morantown†	90	40	64.1	8.48		Monroe†	93	48	75.3	1.10		Lawrence	84	33	56.8	3.52													
Mouthhope *1	88	41	64.9	7.04		Montgomery	96	42	74.6	3.68		Leeds	82	31	55.9	7.04													
Ness City	89	32	62.2	7.97		New Iberia	93	48	75.2	0.95		Leicester Hill	79	33	55.3	2.31													
Newton	84	38	64.7	5.49		Opelousas	96	42	74.5	0.36		Leominster				3.74													
Norton	89			5.60		Oxford	90	39	72.0	0.60		Long Plain				6.04													
Norwich	88	39	63.8	6.04		Palmercourtville†	95	44	75.8	2.34		Lowell a	82	31	56.4	3.04													
Oberlin				5.03		Plain Dealing†	96	40	73.8	2.27		Lowell b	83	29	55.4														
Olathe†	92	37	64.2	11.88		Plaquemine	96	46	75.1	0.00		Lowell c	88	33	57.4														
Osage City†	88	40	64.4	9.92		Rayne	97	42	74.1	2.55		Ludlow	78	27	52.0	4.65													
Oswego	93	41	68.9	6.85		Robeline	92	36	71.5	3.69		Lynn a	85	34	55.3	4.22													
Ottawa	88	38	63.5	11.86		Ruston	94	43	73.5	2.02		Mansfield *1	84	34	54.2	4.70													
Phillipsburg	88	32	59.3	3.39		Schriever	97	43	75.0	0.50		Middleboro	84	26	53.6	4.63													
Pratt				11.20		Shellbeach	94	50	74.3	T.		Monson	80	31	56.3	2.66													
Rome *†1	90	40	64.9	9.17		Southern University†	90	46	72.6	T.		New Bedford a	84	34	54.2	6.82													
Russell	91	30	62.4	5.57		Sugar Ex. Station†	93	50	73.6	T.		New Bedford b	85	33	54.2	6.40													
Salina†	93	35	63.2	5.45		Sugartown	92	47	75.2	2.48		New Salem	76	34	55.2	5.66													
Sedan†	91	42	67.0	5.62		Venice†	89	53	73.8	0.52		Pittsfield	75	37	55.6	5.33													
Seneca	89	35	62.2	3.46		Wallace	93	47	75.2	T.		Plymouth *1	84	39	56.6	4.29													
Toronto	88	40	65.2	5.29		Whitehall	98	42	74.0	1.29		Princeton				3.53													
Ulysses	90	26	60.0	6.27		White Sulphur Springs.	96	43	75.6	3.45		Provincetown	82	33	53.7	3.13													
Viroqua†	94	30	62.6	3.61								Salem				4.32													
Wallace *1	89	32	58.0	5.17		Bar Harbor	79	29	52.4	2.45		Somerset *1	90	32	58.4	4.77	T.												
Wamego *1	88	40	62.6	7.18		Belfast *6	72	43	54.3	1.28		South Clinton				3.37													
Wellington	88	38	66.8	7.69		Calais	81	27	53.0	1.69		Springfield Armory	82	31	54.4	5.50													
Yates Center	91	38	65.7	5.56		Cornish *1	78	58	55.2	3.54		Sterling				3.29													
Kentucky.						Cumberland Mills	78	27	53.2	2.80		Taunton b	84	29	54.8	4.39													
Alpha *2		41	68.7	3.66		Fairfield	79	32	57.1	1.55		Taunton c	83	25	54.8	4.79													
Ashland	91	35	68.4	4.57		Farmington	81	26	53.6	1.79		Turners Falls	79	35	55.6	4.26													
Bardstown†	90	35	67.2	4.11		Flagstaff	80	20	54.5	1.20		Webster				3.35													
Blandville†	87	41	68.2	5.41		Gardner	77	30	55.8	1.60		Westboro†	82	26	56.0	3.04													
Bowling Green b†	90	39	70.4	4.75		Lewiston	81	31	55.5	2.03		Weston	82	29	55.6	3.50													
Burnside†				2.95		Mayfield *1	74	37	52.9	1.88		Williamstown	76	31	55.0	4.10													
Caddo	88	32	65.0	5.02	T.	North Bridgton	79	32	55.2	2.39		Winchendon				4.53													
Carrollton	90	33	68.8	5.20		Orono	76	28	53.8	1.02		Michigan.																	
Cattlettsburg				4.83		Petit Menan *1	62	38	49.7			Adrian	81	35	59.0	3.34													
Earlington	90	42	68.2	6.46		Winslow	77	28	55.1	1.51		Agricultural College	80	32	56.5	2.15													
Edmonton†	86	38	67.2	2.50		Maryland.						Alma	81	31	57.6	2.58													
Ensor	87	40	68.8	5.71		Annapolis	89	40	67.2	3.28		Ann Arbor	79	33	58.6	2.81													
Eubank	88	34	65.8	4.93		Bachmans Valley	87	31	61.1	12.29		Arbela	79	29	56.6	3.06													
Falmouth†																													

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.							
Maximum.		Minimum.		Mean.		Rain and melted snow.		Total depth of snow.		Maximum.		Minimum.		Mean.		Rain and melted snow.		Total depth of snow.		Maximum.		Minimum.		Mean.		Rain and melted snow.		Total depth of snow.	
Stations.						Stations.						Stations.						Stations.											
Michigan—Cont'd.						Minnesota—Cont'd.						Missouri.																	
Holland * ¹⁰	79	35	55.6			Lakeside †	83	34	57.1	5.53		Akron																	
Howell	80	28	57.1	2.39		Lake Winnibigoshish	79	29	52.0	2.96		Arlington																	
Humboldt	81	30	47.6	3.33		Lech Lake	83	26	52.3	3.06		Arthur * ²		40	63.0														
Ionia	85	27	58.2			Long Prairie	80	30	54.6	2.76		Avalon	86	35	63.5														
Iron River	81	23	47.6	3.07		Lutsen	75	30	47.6	4.07		Bagnell																	
Ivan	80	28	54.2	3.27		Luverne †	81	33	55.0	4.27		Bethany		90	37	62.7													
Jackson	81	31	59.4	2.81		Lynd	83	34	55.4	4.24		Birchtree		86	37	66.0													
Jeddo	77	29	54.6	2.16		Mapleplain				6.02		Bolckow																	
Kalamazoo	81	36	59.4	1.56		Montevideo * ¹	81	44	58.8			Boonville †																	
Lake City	79	31	55.1	2.00		Milaca	85	29	54.9	2.91		Brunswick																	
Lansing	79	32	57.1	1.98		Milan †	86	30	56.6	2.36		Carrollton †	87	39	64.7														
Lapeer	78	25	56.4	2.29		Minneapolis a	83	35	57.2	5.53		Conception	89	37	61.6														
Lathrop	75	24	48.8	5.37		Minneapolis b ¹	80	32	56.4	4.48		Cowgill * ⁵	88	34	62.8														
Ludington	76	30	52.9	2.95		Minnesota City †				2.10		Darksville	90	38	63.4														
Luzerne	82	28	53.6	2.41		Montevideo †	84	33	56.8	3.43		Downing																	
Mackinaw City	75	30	48.7	4.40		Morris	84	30	56.5	2.09		East Lynne * ²		38	61.3														
Madison	81	35	60.0	2.85		Mount Iron	80	22	47.0	2.40		Edgehill * ⁶	86	40	66.6														
Mancelona	84	26	52.4	4.15		Newfolden	84	26	52.5	1.74		Eightmile * ¹	84	40	62.4														
Manistee	78	22	51.6	2.50		New London	84	32	58.1	1.71		Eldon	97	37	67.0														
Manistique				3.90		New Richland * ¹	87	42	56.1			Elmira	87	33	61.4														
Middle Island * ¹⁰	73	35	50.8			New Ulm †	85	37	57.7	3.08		Fairport																	
Midland	81	26	55.2	1.50		Park Rapids †	80	27	51.6	3.47		Farmersville																	
Mottville	81	34	59.0	3.06		Pine River	79	30	54.6	4.53		Fayette	93	41	67.5														
Mount Clemens	80	29	57.8	1.20		Pleasant Mounds	81	31	57.5	2.29		Fulton																	
Mount Pleasant b	81	31	55.5	2.37		Pokegama Falls	81	24	50.6	3.19		Gallatin * ¹	89	35	62.6														
Muskellonge Lake * ¹⁰	72	33	46.6			Redwing				3.08		Glasgow	89	38	64.7														
Muskegon	79	36	55.3	2.67		Reeds				1.88		Gordonville * ²		40	64.0														
Newberry	76	25	49.5	3.35		Rolling Green	82	34	58.5	2.60		Gorin																	
North Manitou Island * ¹⁰	70	30	49.6			Roseau	74	24	46.8	0.89		Halfway	88	39	66.6														
North Marshall	81	30	56.9	2.74		St. Charles †	81	27	57.0	1.80		Harrisonville †	80	40	63.9														
Northport	76	30	52.5	2.50		St. Cloud	84	36	56.8	2.96		Hermann †																	
Old Mission	80	34	54.0	3.12		St. Olaf	84	32	55.4	1.70		Houston	80	37	66.8														
Olivet	79	34	57.9	1.71		St. Peter	81			3.41		Houstonia																	
Omer	79	30	54.4			Sandy Lake Dam	81	28	51.1	2.67		Irena																	
Ottawa Point * ¹⁰	75	36	52.2			Sauk Center	86			2.66		Ironton †	89	36	66.2														
Ovid	80	31	57.7	1.89		Shakopee	82	40	59.4	4.16		Jefferson City †	93	40	67.2														
Owosso	83	29	58.5	2.44		Tower †	82			5.70		Kidder	85	37	61.8														
Parkville				3.69		Two Harbors	81	30	49.4	3.54		Lamar †	93	40	67.9														
Pentwater * ¹⁰	72	40	55.1			Wabasha * ¹	86	43	58.8	1.79		Lamonte																	
Petoskey	75	30	50.9	3.77		Willmar	83	35	56.4	3.85		Lebanon	86	40	66.8														
Plymouth	80	30	56.0	1.26		Winnebago City	84	35	57.6	4.00		Lexington	90	38	65.0														
Pointe aux Barques * ¹⁰	77	38	54.7			Worthington	81	36	55.6	5.70		Liberty	87	42	64.0														
Port Betsey * ¹⁰	74	36	51.6			Zumbrota †	82	30	57.8			Louisiana	90	41	64.2														
Port Austin	77	35	54.5	2.14								McCune * ¹	87	43	63.1														
Powers	80	27	51.9									Mansfield																	
Reed City	84	30	54.8	1.52		Mississippi.	101	38	74.0	1.40		Marblehill	86	38	66.2														
Rockland	83	29	51.6	2.18		Agricultural College	93	44	72.2	4.17		Marshall †	87	38	63.4														
Rogers	81	27	51.3	3.76		Austin †	91	49	73.2	5.22		Maryville	88	36	61.0														
Romeo	77	34	56.6	1.60		Batesville †	90	44	71.8	5.29		Mexico †	90	40	64.7														
Saginaw	81	32	57.9	2.41		Bay St. Louis	89	47	74.5	1.29		Mineralspring	87	38	65.8														
St. Ignace	75	30	50.0	3.22		Biloxi †	89	40	75.3	1.23		Montreal	87	39	66.2														
St. Johns	80	29	58.8	2.07		Booneville	90	43	72.7	4.18		Mount Vernon	92	41	69.2														
St. Joseph	80	38	55.6	1.39		Briers	90	50	73.8	0.14		Neosho	88	38	67.1														
Sandbeach	77	33	52.0	1.82		Brookhaven †	98	42	75.2	1.45		Nevada	88	40	66.2														
Somers	78	32	57.1	2.11		Burke	91	51	73.4	1.80		New Haven	89	41	66.8														
South Haven	80	33	54.7	1.79		Canton †	94	44	73.6	2.90		New Madrid	88	43	70.7														
Sturgeon Point * ¹⁰	71	28	52.6			Columbus a				1.59		New Palestine	88	40	68.2														
Thomaston	76	25	53.9	2.18		Colum																							

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.	
Maximum.		Minimum.		Mean.		Rain and melted snow.	Total depth of snow.	Maximum.		Minimum.		Mean.		Rain and melted snow.	Total depth of snow.	Maximum.		Minimum.		Mean.		Rain and melted snow.	Total depth of snow.
Stations.		Stations.		Stations.				Stations.		Stations.		Stations.											
Montana—Cont'd.						Nebraska—Cont'd.						Nevada—Cont'd.											
Chinook †	78	28	52.2	1.01		Hooper *1	88	38	58.8	5.57		Lewers Ranch	78	28	51.3	1.07							
Choteau	78	24	49.5	3.75	T.	Imperial †	87	30	58.1	7.29	3.5	Los Vegas	85	41	62.8	0.20							
Columbia Falls	77	28	51.0	1.75		Indianola (near) *1				5.22		Lovelocks				1.55							
Crow Agency	82	26	53.8	3.00	T.	Johnstown				6.05		McGill	78	27	52.0	1.82							
Dearborn Canyon	75	20	46.8	7.73	9.0	Kearney				4.11		Martins	79	30	52.9	0.79							
Deer Lodge		24		2.83		Kennedy	88	29	54.6	8.63		Midas	75	27	48.1	3.19	17.5						
Dupuyer	76	24	48.6	1.25	6.0	Kimball †	85	27	53.0	6.49	15.0	Mill City	90	40	55.6	1.70							
Fort Benton	77	29	51.7	3.25		Kirkwood *1	90	35	55.9	6.26		Monitor Mill	79	24	48.0	2.48							
Fort Keogh †	90	30	59.6	2.42		Lexington †	85	27	56.2	2.62		Osceola	79	30	54.6	1.70	3.0						
Fort Logan	73	19	48.4	4.48		Lincoln †	85	37	60.2	4.26		Palsade *1	82	35	58.2	0.50							
Fort Missoula	78	27	56.0	4.80		Lincold †	87	36	60.5	3.81		Palmetto	77	27	49.6	4.05	32.0						
Glendive †		32		2.00		Lodgepole †	85	30	54.2	3.55	3.0	Panaca	93	27	58.7	1.70							
Glenwood	76	22	48.3	4.06		Loup b *1	86	34	56.4	2.30		Reno *1	92	32	57.9								
Greatfalls †	76	30	53.6	3.22	T.	Lynch †	92	36	57.2	6.05		Reno State University	80	33	51.7	0.95							
Kalispell	80			1.41		Lyons				4.99		Ruby Valley				2.65							
Kipp †	84	19	47.3	3.82	11.4	McCook *1	87	37	60.7	3.95		St. Clair	81	35	55.2	2.73							
Lewistown	76	24	49.2	4.41	0.5	McCool				4.24		San Antonio	85	25	53.6	0.83							
Livingston †	83	28	48.8	4.03	T.	Madison	84	35	56.8	4.33		Sodaville	86	33	57.2	2.16							
Manhattan †	82	25	50.2	3.00		Madrid *5	85	33	54.6	4.08		Spring Valley	80	35	54.0	0.21							
Martinsdale †	76	26	47.2	4.43		Marquette				3.85		Teocoma *1	70	38	47.7	1.00							
Marysville †	72	22	45.0	5.77	3.6	Merriman				6.80		Toano *1	80	30	50.4	4.04	3.0						
Parrot	80	26	50.7	4.19		Minden a	88	32	57.5	5.34		Tybo	80	28	51.8	4.15							
Poplar	87	32	55.2	0.85		Minden b				4.91		Verdi *1	90	30	51.6	0.91							
Radersburg	76	29	47.0	2.10		Monroe				5.09		Wadsworth *1	86	40	58.4	1.37							
Red Lodge	73	24	44.8	12.63	16.0	Nebraska City c	90	30	60.0	2.67		Wells	86	21	49.9	1.41							
St. Ignatius Mission	77	29	52.2	3.32		Nemaha *1	89	40	62.0	5.40		New Hampshire.											
St. Pauls †	74	28	50.5	0.14		Nesbit	86	30	53.9	6.16		Airstead *6	76	36	56.4	4.30							
Troy	86	26	53.4	2.13		Norfolk b	84	35	57.5	3.53		Berlin Mills	83	14	51.2	1.42							
Utica	78	22	48.2	5.87	13.0	Norman				3.72		Bethlehem	76	32	54.4	2.83							
Wibaux	84	24	52.8	0.90		North Loup	86	31	58.0	3.65		Brookline *1	84	28	58.6	3.55							
Yale	75	28	46.2	2.89	3.0	Oakdale †	90	33	57.4	5.75		Claremont	82	30	55.4	3.37							
Nebraska.						Odell †	84	38	61.7	4.98		Concord	83	27	55.4	2.92							
Agee *1	89	38	57.0	5.46		O'Neill †	87	32	54.6	5.62		Durham	83	28	55.1	3.79							
Albion	86	31	59.8	4.03		Ord	84	28	56.2	3.43		Hanover	79	29	55.2	2.71							
Alexandria				6.13		Osceola				3.68		Keene	81	29	55.6	4.58							
Alliance				4.81	2.0	Ough †				5.50		Littleton	77	30	54.7	1.46							
Alma *1	86	38	57.8	6.36		Palmer b				3.38		Nashua	84	22	55.4	2.92							
Ansley †	93	29	57.0	3.87		Plattsmouth a				4.40		Newton	83	24	53.9	4.22							
Arapahoe *1	88	38	58.0	2.89		Ravenna a	85	32	56.8	3.15		North Conway	86	27	54.6	2.55							
Arborsville †	88	28	57.8	3.92		Redcloud a				3.50		Peterboro	81	27	53.3	4.59							
Ashland a †	86	34	60.3	5.16		Redcloud b *1	90	38	64.0	3.25		Plymouth	83	25	54.7	2.90							
Ashland b *1	96	41	63.2	5.95		Republican *1	88	32	62.7	5.03		Sanborn †	78	30	53.4	3.40							
Ashton	86	34	57.8	2.29		Rulo *1	92	40	63.2	6.89		Stratford	78	25	54.0	2.10							
Anuburn *1	92	36	61.5	6.04		St. Libory	88	34	59.0	4.36		Warner				4.12							
Aurora *1	98	37	61.9	3.73		St. Paul	86	34	59.0	3.43		New Jersey.											
Beatrice †	87	32	60.1	3.64		Salem *1	84	40	59.8	5.57		Asbury Park	80	36	56.4	6.68							
Beaver City †	90	32	58.5	3.69		Santee Agency †	90	36	58.8	4.56		Barnegat	84	41	54.2	5.63							
Bellevue				3.26		Sargent				3.21		Bayonne	91	38	58.8	6.35							
Benedict				3.99		Schuyler				6.78		Belvidere	87	29	58.3	7.81							
Benkelman				5.31		Seneca *1	86	30	55.2	8.25		Bergen Point	87	40	58.4	6.75							
Blair	85	38	58.4	6.70		Seward *1	80	39	58.0	5.14		Beverly †	93	36	61.0	5.70							
Bluehill				5.05		Springview	85	33	53.7	5.85		Billingsport *1	82	47	60.4	8.03							
Brokenbow				4.71		Stanton *1	89	38	59.4	3.90		Boonton	88	36	58.3	7.70							
Burchard				6.90		Stockham				3.00		Bridgeon	93	39	62.9	8.12							
Burwell				3.14		Strang *1	90	40	62.8	5.81		Camden	88	37	60.2	5.80							
Callaway †	80	30	54.8	4.45		Stratton				4.53		Cape May C. H. †	87	40	57.8	6.70							
Camp Clarke	88	31	54.7	4.22		Superior *5	90	38	62.5	4.96		Charlotteburg	84	30	56.4	7.63							
Central City *5	86	38	60.8	5.25		Syracuse				4.96		Chester	83	34	56.3	6.26	T.						
Cody				4.35		Tablerock	92			6.29		Clayton	91	37	60.2	5.80							
Columbus †	86	34	58.6	5.92		Tecumseh b †	92	35	64.2	4.00		College Farm †	88	36	59.4	7.86							
Cornelia				6.18		Tekamah	88	36	59.6	5.13		Deckertown	84	30	58.6	7.06							
Crichton †	90	31	57.0	6.74		Theford *1	82	28	52.0	8.90		Dover	87	34	57.4	6.77							
Crete	84	35	60.0	3.30		Turlington †	86	34	56.2	3.49		Egg Harbor City	92	37	58.2	5.57							
Culbertson				3.84		Valentine †	89	29	54.2	5.98		Elizabeth †	92	36	59.0	7.42							
Curtis a	87	30	60.0	5.34		Walparaiso				7.15		Englewood	91	34	57.6	8.87							
Danabrog *1	92	40	62.7	3.72		Wakefield	86	33	58.4	5.02		Flemington	93	36	59.8	8.58							
David City	85	35	57.3	6.80		Wallace				4.80		Franklin Furnace	84	29	57.2	7.19							
Dawson	88	35	61.6	6.92		Weeping Water *1	90	33	57.1	3.41		Freehold	86	35	58.2	7.97							
Divide				2.38		Westpoint †	87	35	59.6	4.08		Friesburg	91	37	60.8	6.01							
Dunning *1	84	38	58.0	2.22		Wilber *1	84	36	63.8	5.30		Gillette	85	36	57.4	7.43							
Eden				6.13		Willard				3.60		Hammonton				5.16							
Edgar				2.98		Wilsonville *1	88	36	60.3	4.82		Hanover	86	36	58.5	7.10							
Ericson *1	88	38	59.2	3.92		Wisner				3.95		Hightstown	90	39	60.3	6.52							
Ewing †				3.81		Wymore *1	87	41	62.4	5.27		Imlaystown	93	36	61.4	7.16							
Fairbury †	87	34	60.8	5.14		York *1	89	40	58.8	4.63		Junction				9.13							
Fairfield				4.29		Nevada.						Lambertville	91	34	60.2								

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.																																																																																																																																																																																																																																																																																																																								
Stations.						Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.	Stations.						Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.	Stations.						Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.																																																																																																																																																																																																																																																																																																														
New Mexico.											New York—Cont'd.											North Carolina—Cont'd.																																																																																																																																																																																																																																																																																																																								
Albert	92	38	65.5	1.30		Napoli	88	36	63.5	1.96		Waynesville †	88	36	63.5	1.96		Weldon †	92	40	69.3	6.14		North Dakota.																																																																																																																																																																																																																																																																																																																						
Albuquerque †	88	36	63.4	0.12		Newark Valley	92	40	69.3	6.14		Amenia	86	26	53.7	3.20		Aneta	86	26	53.7	3.20		Ashley †	83	25	51.4	2.44		Bottineau	87	19	51.8	0.05		Buxton	82	26	52.4	3.25		Churchs Ferry	91	20	52.9	2.21		Coal Harbor	84	25	53.0	0.99		Devils Lake	86	28	52.8	1.39		Dickinson †	86	28	52.6	2.00		Ellendale	86	29	52.0	2.40		Fargo †	84	21	53.0	4.15		Forman †	84	23	52.3	3.31		Fort Berthold	91	29	55.2	2.04		Fort Yates †	86	27	53.4	4.05		Fullerton †	88	24	53.6	2.24		Gallatin †	86	14	52.3	2.50		Glenullin	81	22	48.6	1.42		Goetz	90	22	51.6	0.05		Grafton †	85	26	54.4	1.05		Hamilton	85	23	51.8	1.25		Jamestown †	86	25	52.2	4.02		Kelso	84	27	53.7	4.56		Langdon	82	21	50.6	1.15		Larimore †	87	24	50.7	2.96		Lisbon	86	28	52.6	3.88		McKinney	88	21	52.4	0.01		Mayville	86	28	54.0	2.84		Medora †	91	24	56.4	3.40		Melville	85	22	52.8	2.33		Milton †	82	21	51.8			Minnewaukon	84	22	57.8	1.08		Minot	85	28	54.4	0.05		Minto †	89	23	53.3	1.94		Napoleon †	84	26	52.3	3.77		New England City	78	24	49.8	1.59		Oakdale †	84	27	52.8	2.16		Pembina	89	24	54.0	0.95		Portal	84	21	50.7	0.82		Power †	84	28	52.3	2.31		St. John †	81	23	51.6	0.24		Sheyenne	90	29	52.4	2.45		Steele †	84	29	53.0	2.08		Towner †	85	25	51.8	0.85		University	82	25	52.6	2.32		Valley City †	82	27	53.0	3.94		Wahpeton †	92	25	56.4	2.09		Washburn	87	19	52.4	1.55		White Earth	83	28	49.9	0.26		Whites Ranch		24		2.73		Wildrice †			54.6	4.24		Willow City	86	18	52.8	0.25		Woodbridge †	85	20	50.5	0.15		Ohio.										
Adams	81	33	57.8	4.12		Asheville †	92	35	66.2	2.95	T.	Akron	82	33	59.1	3.96		Annapolis	85	33	60.9	4.16		Ashland	78	31	57.6	3.64		Ashtabula	83	36	57.4	2.79		Atwater				4.25		Bangorville	84	34	59.9	4.94		Basin				4.18		Bellefontaine	80	38	60.8	4.08		Bement				3.42		Benton Ridge	83	35	60.1	4.36		Bethany	88			3.25	2.0	Big Prairie	83	35	59.4	4.23		Binola				3.03		Bissella	82	34	59.8	2.47		Bladensburg	86	32	60.6	5.52		Bloomington	85	36	62.4	5.24		Bowling Green	83	34	59.4	5.04		Bucyrus	82	36	60.0	4.66		Cambridge	85	31	58.5	4.64		Camp Dennison	88	34	64.4	3.26	T.	Canal Dover	86	32	59.8	5.62		Canton †	84	36	60.1	4.84		Carrollton	85	30	60.0	4.43		Cedarville				6.25		Celina	84	36	61.0	5.05		Cherryfork	90	33	64.8	3.72		Chillicothe	87	35	62.7	4.12		Circleville	86	36	62.0	6.33		Clarksburg	87	35	63.0	2.99	T.	Cleveland a.	81	37	58.6	2.75		Cleveland b	81	38	58.8	2.27		Clifton	87	34	61.6	4.05	T.	Coalton	89	32	63.0	4.95		Dayton a	88	36	64.0	3.49		Dayton b †				3.02		Defiance	83	35	60.2	4.89		Delaware	80	39	61.5	5.05		Demos	85	36	60.8	3.13		Dupont	82	36	60.8	5.23		Elyria	83	35	59.4	2.68																																																																																				

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.		Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Ohio—Cont'd.						Oklahoma—Cont'd.						Pennsylvania—Cont'd.					
Fairport Harbor *10	83	40	58.8		Ins.	Fort Sill	91	42	68.8	6.53		Cassandra	80	33	56.2	6.35	
Findlay	85	32	60.8	4.36		Guthrie	96	44	72.5	6.55		Cedarhurst	82	34	58.4	1.35	
Frankfort	88	34	62.4	3.58		Hennessey	96	36		6.76		Centerhall†	88	38	62.1	4.87	
Garrettsville†	80	30	57.8	3.11		Hopeton	95	38	67.6	7.21		Chambersburg†	88	38	62.1	4.73	
Granville	86	34	60.5	6.39		Jefferson	93	38	68.6	7.53		Coatesville	94	34	61.4	4.89	
Gratiot	84	36	61.8	4.12		Kingfisher	90	39	68.7	8.46		Confluence†	86	30	60.4	4.35	
Greenfield	88	38	64.4	3.00		Mangum†	97	40	69.8	5.17		Coopersburg	85	34	59.5	7.05	
Greenhill	85	30	57.8	3.89		Newkirk	94	39	68.2	6.53		Davis Island Dam†				3.93	
Greenville	80	38	60.4	3.63		Norman†	93	41	70.0	11.74		Derry Station	86	31	62.6	4.34	
Hackney	86	40	65.0	3.03		Pawhuska	89	42	68.0	8.07		Doylestown				5.94	
Hanging Rock	91	36	64.0	3.32		Prudence†		36		5.53		Driftwood				4.05	
Hedges	82	35	60.0	4.00		Sac and Fox Agency	91	42	68.0	10.18		Duncannon				6.90	
Hillhouse	81	29	56.2	2.72		Stillwater†	90	41	68.5	8.56		Dushore	80	22	56.6	3.63	
Hillsboro†	91	34	64.0	3.09		Waukomis	94	40	68.9	5.61		East Bloomsburg	88	32	59.8	5.67	
Hiram	79	34	58.2	3.00		Winnview	89	39	68.8	13.38		Easton	86	31	60.2	8.03	
Hudson	84	32	59.6	3.43		Oregon.						Ellwood Junction†				4.51	
Jacksonboro	88	32	63.9	3.10		Albany a	85	36	56.6	1.95		Emporium	82	30	60.1	4.21	
Kenton	85	36	60.6	3.77		Albany b				1.36		Kverett	86	34	60.8	3.20	
Killbuck	85	36	59.7	4.70		Arlington	86	37	59.9	0.56		Farrandville				3.55	
Lancaster	85	36	61.2	6.10		Ashland b	89	32	55.0	1.55		Forks of Neshaminy *1	87	41	61.5	7.54	
Lepale	84	34	59.2	5.14		Aurora *1	90	45	56.7	1.48		Franklin	83	29	58.6	4.08	
Levering	86	30	59.6	5.15		Aurora (near)	90	32	54.8	1.97		Frederick				6.21	
Logan	92	33	63.2	4.21		Bandon	72	42	54.1	2.83		Freeport†				3.39	
Lordstown	84	34	58.6	4.45		Bay City†	81	35	54.1	6.18		Girardville				6.33	
McArthur	88	31	61.6	4.53		Beulah	85	33	52.4	1.39		Gramplan	82	38	59.6	3.30	
McConnellsville†	88	35	61.9	4.40		Brownsville *1	87	50	58.8	2.30		Greensboro†	90	32	62.6	3.67	
Mansfield†				6.65		Burns	80	22	48.5	1.52		Greenville	80	31	62.0	3.59	
Marletta b	86	39	63.8	2.77		Burns (near)				2.37		Hamburg	90	32	62.1	7.85	
Marion	84	35	60.8	3.82		Cascade Locks	86	38	57.8	2.67		Hawley	87	31	58.9	4.95	
Medina	82	32	59.0	3.05		Comstock *1	83	40	53.3	3.14		Hews Island Dam				4.45	
Millfordton	83	34	58.4	5.28		Coquille River				0.36		Holidaysburg	88	31	62.2	6.30	
Milligan	90	32	61.5	4.97		Corvallis	85	34	54.9	2.25		Huntingdon a†	87	31	61.8	6.16	
Millport	82	35	58.6	3.86		Daville†	88	28	54.6	2.28		Huntingdon b				4.60	
Montpelier	81	33	58.9	4.31		Eugene				3.06		Indiana				4.91	
Napoleon	84	32	60.2	4.80		Fairview	73	35	50.4	3.51		Irwin				4.63	
Neapolis				4.10		Falls City	85	34	54.0	2.00		Johnstown†	87	34	62.8	7.28	
New Alexandria	82	39	59.6	5.77		Forest Grove	89	32	55.1	2.48		Karlsruhe				1.92	
New Berlin	84	34	59.2	4.86		Fort Klamath	77	22	48.8	2.11		Keating				3.30	
New Bremen	82	35	62.1	2.72		Gardiner	86	40	55.2	4.98		Kennett Square	91	36	60.9	4.60	
New Holland	86	37	63.3	4.30		Glenora	87	33	52.4	5.59		Lansdale				5.82	
New Paris	83	36	61.0	3.30		Government Camp	74	25	43.8	3.69		Lawrenceville	81			3.62	
New Waterford	90	30	60.8	4.18		Grants Pass a†	88	31	56.0	1.90		Lebanon	88	33	61.0	7.90	
North Lewisburg	85	38	61.2	5.80		Happy Valley	81	19	47.4	2.45		Leroy†	79	34	57.0	3.65	
North Royalton	82	34	58.7	2.95		Heppner	80	28	52.4	1.11		Lewisburg	87	32	60.8	6.04	
Norwalk	88	33	59.3	2.83		Hood River (near)	85	36	55.8	0.86		Lock Haven a†	89	34	63.2	4.43	
Oberlin				3.40		Jacksonville	87	34	56.0	1.77		Lock Haven b				4.10	
Ohio State University	84	35	61.4	5.83		Joseph	75	24	47.2	2.76		Lock No. 4†				3.72	
Orangeville	86	30	57.8	3.09		Junction City *1	84	40	56.3	2.08		Lycippus	84	35	61.2	3.82	
Ottawa	83	37	61.4	5.26		Lafayette *1	84	44	57.4	1.61		Mifflin				5.60	
Pataskala†	87	36	62.2	5.20		Lagrange	83	31	52.8	1.72		Oil City†				4.64	
Perry				2.39		Lakeview†	80	27	50.0	1.74		Ottsville				6.27	
Philo	90	35	62.2	5.26		Langlois	83	36	56.0	6.23		Parker†				3.92	
Plattsburg	85	35	61.0	4.85		Lone Rock	78	27	49.8	1.59		Philadelphia b	91	38	61.3	5.84	
Point Marblehead *10	88	43	62.2			McMinnville	90	38	55.4	1.61		Point Pleasant				10.15	
Pomeroy	91	36	64.9	2.79		Merlin *1	88	44	58.2	1.00		Pottstown	90	35	61.6	5.95	
Portsmouth a†				3.53		Monmouth a *1	90	44	59.1	1.52		Quakertown	88	33	59.4	6.26	
Portsmouth b	92	36	66.4	3.50		Monmouth b	87	32	53.8	1.19		Reading				61.0	
Richwood	82	38	61.8	5.99		Monroe	81	35	54.8	1.61		Reidsville	86	32	60.6		
Ridgeville Corners	85	33	59.1	4.54		Moro	78	32	52.5	0.65		Renovo a				3.12	
Ripley	87	33	64.2	3.43		Mount Angel†	88	35	56.4	2.65		Renovo b	85	34	61.6	3.18	
Rittman	84	30	55.8	4.23		Nehalem				3.56		Ridgway†				3.78	
Rockyridge	83	36	61.4	3.66		Newberg	90	32	54.2	2.35		Saegertown	83	25	56.0	4.00	
Rosewood	81	37	60.4	3.61		Newbridge	87	28	55.8	4.62		St. Marys	79	33	56.8	3.52	
Sidney b	86	38	62.0	4.78		Newport	81	38	52.5	4.02		Salem Corners	77	37	56.3	5.55	
Sinking Spring†	85	36	62.8	4.23		Pendleton	86	30	57.5	1.55		Scranton	81	33	58.1	4.47	
Somerset†	88			3.97		Placer				3.67		Seisholtzville				6.23	
Springboro				3.61		Prineville	93	23	57.2	1.61		Selinsgrove	87	32	60.2	5.28	
Strongsville				3.43		Riddles *1	85	30	51.4	4.09		Shawmont				4.97	
Sylvania	84	35	58.8	2.16		Riverside†	86	25	52.4	1.17		Shinglehouse	82	26	56.4	5.07	
Thurman	89	35	63.2	2.84		Salem b†	85	36	56.2	1.75		Sinnamahoning				3.78	
Tiffin†	81	37	60.4	4.36		Sheridan *1	78	44	53.5	1.04		Smiths Corners				7.80	
Upper Sandusky	83	37	60.4	4.66		Silver Lake	82	19	47.4	1.87		Somers†	84	30	58.1	3.91	
Urbana	83	37	61.4	3.46		Silverton *1	90	50	59.9	2.35		South Bethlehem	88	34	61.7		
Vanceburg	89	34	63.2	2.53		Siskiyou *1	85	39	61.4	1.75		South Eaton	78	38	58.6	3.67	
Van Wert	82	36	59.5	6.09		Sparta	75	22	49.4	1.87		State College	83	35			

TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.		Temperature. (Fahrenheit.)						Precipitation.					
Stations.						Stations.		Stations.						Stations.		Stations.						Stations.					
Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.		Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Rhode Island—Cont'd.						South Dakota—Cont'd.						Texas—Cont'd						Vermont.									
Providence c.....						Wolsey.....						Forestburg.....						Bennington.....									
South Carolina.						Tennessee.						Forestburg.....						Bennington.....									
Allendale.....						Andersonville.....						Forestburg.....						Bennington.....									
Anderson t.....						Arlington.....						Forestburg.....						Bennington.....									
Batesburg t.....						Ashwood.....						Forestburg.....						Bennington.....									
Blackville t.....						Benton (near) t.....						Forestburg.....						Bennington.....									
Camden.....						Bluff City t.....						Forestburg.....						Bennington.....									
Central.....						Bolivar t.....						Forestburg.....						Bennington.....									
Cheraw a t.....						Bristol t.....						Forestburg.....						Bennington.....									
Cheraw b t.....						Brownsville.....						Forestburg.....						Bennington.....									
Clemson College a.....						Byrdstown.....						Forestburg.....						Bennington.....									
Clemson College b.....						Carthage t.....						Forestburg.....						Bennington.....									
Conway t.....						Center Point.....						Forestburg.....						Bennington.....									
Darlington.....						Clarksville.....						Forestburg.....						Bennington.....									
Edisto t.....						Clinton t.....						Forestburg.....						Bennington.....									
Edinburgh t.....						Covington.....						Forestburg.....						Bennington.....									
Florence.....						Decatur t.....						Forestburg.....						Bennington.....									
Gaffney t.....						Dover.....						Forestburg.....						Bennington.....									
Georgetown t.....						Dyersburg.....						Forestburg.....						Bennington.....									
Gillisonville.....						Elizabeth t.....						Forestburg.....						Bennington.....									
Greenville t.....						Elk Valley.....						Forestburg.....						Bennington.....									
Greenwood.....						Erasmus.....						Forestburg.....						Bennington.....									
Holland.....						Fairmount * b.....						Forestburg.....						Bennington.....									
Kingstree a t.....						Florence t.....						Forestburg.....						Bennington.....									
Kingstree b.....						Franklin.....						Forestburg.....						Bennington.....									
Little Mountain.....						Grace t.....						Forestburg.....						Bennington.....									
Longshore t.....						Greenville t.....						Forestburg.....						Bennington.....									
Marion.....						Harriman.....						Forestburg.....						Bennington.....									
Mount Carmel t.....						Hohenwald t.....						Forestburg.....						Bennington.....									
Pinopolis * t.....						Jackson t.....						Forestburg.....						Bennington.....									
Port Royal t.....						Johnsonville.....						Forestburg.....						Bennington.....									
St. Georges t.....						Jonesboro * t.....						Forestburg.....						Bennington.....									
St. Matthews t.....						Kingston t.....						Forestburg.....						Bennington.....									
St. Stephens t.....						Lafayette.....						Forestburg.....						Bennington.....									
Santuck t.....						Lewisburg * t.....						Forestburg.....						Bennington.....									
Shaws Fork * t.....						Liberty t.....						Forestburg.....						Bennington.....									
Smiths Mills t.....						Lynnville t.....						Forestburg.....						Bennington.....									
Society Hill t.....						McKenzie t.....						Forestburg.....						Bennington.....									
Statesburg t.....						McMinnville t.....						Forestburg.....						Bennington.....									
Trenton.....						Madison.....						Forestburg.....						Bennington.....									
Trial.....						Maryville * b.....						Forestburg.....						Bennington.....									
Walhalla.....						Milan.....						Forestburg.....						Bennington.....									
Windsboro.....						Newmarket * b.....						Forestburg.....						Bennington.....									
Yemassee t.....						Newport t.....						Forestburg.....						Bennington.....									
Yorkville.....						Nunnally.....						Forestburg.....						Bennington.....									
South Dakota.						Texas.						Forestburg.....						Bennington.....									
Aberdeen t.....						Albany * t.....						Forestburg.....						Bennington.....									
Alexandria t.....						Anson.....						Forestburg.....						Bennington.....									
Armour.....						Arthur City t.....						Forestburg.....						Bennington.....									
Ashcroft t.....						Austin a.....						Forestburg.....						Bennington.....									
Bowdle.....						Austin b * b.....						Forestburg.....						Bennington.....									
Brookings t.....						Ballinger t.....						Forestburg.....						Bennington.....									
Canton.....						Beeville t.....						Forestburg.....						Bennington.....									
Centerville.....						Blanco t.....						Forestburg.....						Bennington.....									
Chamberlain t.....						Boerne * t.....						Forestburg.....						Bennington.....									
Desmet.....						Brazoria t.....						Forestburg.....						Bennington.....									
Doland.....						Brenham t.....						Forestburg.....						Bennington.....									
Farmington.....						Brighton.....						Forestburg.....						Bennington.....									
Flandreau.....						Brownwood.....						Forestburg.....						Bennington.....									
Forestburg t.....						Burnet * t.....						Forestburg.....						Bennington.....									
Forest City.....						Camp Eagle Pass t.....						Forestburg.....						Bennington.....									
Fort Meade t.....						Childress.....						Forestburg.....						Bennington.....									
Gann Valley.....						Coleman.....						Forestburg.....						Bennington.....									
Gary.....						College Station.....						Forestburg.....						Bennington.....									
Gondville.....						Colmesneil.....						Forestburg.....						Bennington.....									
Harney.....						Columbia t.....						Forestburg.....						Bennington.....									
Highmore.....						Conroe.....						Forestburg.....						Bennington.....									
Hitchcock.....						Coriscana b t.....						Forestburg.....						Bennington.....									
Hot City t.....						Cuero t.....						Forestburg.....						Bennington.....									
Hot Springs.....						Dallas t.....						Forestburg.....						Bennington.....									
Howard t.....						Danevang t.....						Forestburg.....						Bennington.....									
Interior.....						Dublin t.....						Forestburg.....						Bennington.....									
Ipswich.....						Duval * t.....						Forestburg.....						Bennington.....									
Kimball t.....						Emory.....						Forestburg.....						Bennington.....									
Leslie t.....						Estelle t.....						Forestburg.....						Bennington.....									
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Menno t.....												Forestburg.....						Bennington.....									
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Montrose.....												Forestburg.....						Bennington.....									
Nowlin.....												Forestburg.....						Bennington.....									
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Parker t.....												Forestburg.....						Bennington.....									
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Plankinton t.....												Forestburg.....						Bennington.....									
Redfield.....												Forestburg.....						Bennington.....									
Reichford.....												Forestburg.....						Bennington.....									
Rosebud.....												Forestburg.....						Bennington.....									
Rosedale.....												Forestburg.....						Bennington.....									
Rushville.....												Forestburg.....						Bennington.....									
Salem.....												Forestburg.....						Bennington.....									
Savannah.....												Forestburg.....						Bennington.....									
Shelby.....												Forestburg.....						Bennington.....									
Spartanburg.....												Forestburg.....						Bennington.....									
St. George.....												Forestburg.....						Bennington.....									
St. Ignace.....												Forestburg.....						Bennington.....									
St. Joseph.....												Forestburg.....						Bennington.....									
St. Louis.....												Forestburg.....						Bennington.....									
St. Paul.....												Forestburg.....						Bennington.....									
St. Peter.....												Forestburg.....						Bennington.....									
St. Vincent.....												Forestburg.....						Bennington.....									
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TABLE II.—Meteorological record of voluntary and other cooperating observers—Continued.

Stations.	Temperature. (Fahrenheit.)			Precipitation.	
	Maximum.	Minimum.	Mean.	Rain and melted snow.	Total depth of snow.
Vermont—Cont'd.	°	°	°	Inch.	Inch.
Brattleboro	83	27	56.6	5.19	
Burlington †	76	38	57.6	2.14	
Chelsea †	73	31	52.1	3.34	
Cornwall	77	34	55.4	3.49	
Enosburg Falls	78	27	55.8	2.70	
Hartland †	79	26	53.6	3.99	
Jacksonville	72	26	50.4	6.44	
Norwich	79	26	53.0	3.25	
St. Johnsbury	76	29	54.3	2.46	
Vernon * ¹	83	46	57.0	4.52	
Wells	80	35	55.2	2.82	
Woodstock	76	26	52.2	2.92	
Virginia.					
Alexandria	93	37	65.4	3.05	
Ashland †	93	38	65.8	6.05	
Balls Bluff	98	36	67.3	5.48	
Barboursville	89	35	66.0	7.66	
Bedford City	93	38	68.4	7.81	
Big Stone Gap †	88	36	65.3	5.18	
Birds Nest * ¹	92	47	65.2	4.20	
Blacksburg	88	33	62.2	5.83	
Buckingham †	92	33	66.0	3.53	
Burke's Garden				5.48	
Callville †	89	38	65.7	6.24	
Charlottesville	90	38	66.0	7.37	
Christiansburg				5.86	
Clarksville				5.46	
Clifton Forge	89	35	65.4	4.13	
Dale Enterprise †	90	30	62.0	4.94	
Danville				3.87	
Doswell	96	35	67.2	3.82	
Dwale				6.44	
Farmville	95	38	68.6	5.49	
Fredericksburg †	96	35	66.2	7.47	
Graham's Forge	87	36	63.2	4.94	
Hampton	89	44	66.1	4.66	
Lexington †	89	36	64.6	5.81	
Maidens				4.56	
Manassas †	91	34	64.9	3.89	
Marion	91	36	62.6	5.63	
Miller School	91	40	66.7	5.06	
Petersburg †	93	38	67.7	5.35	
Radford				4.95	
Richmond (near) †	93	38	67.0	6.95	
Rocky Mount †	90	36	67.6	4.25	
Salem †	89	37	67.0	6.74	
Spears Ferry				4.50	
Spottsville †	93	38	67.4	4.32	
Stanardsville †	91	33	64.5	5.72	
Stanston †	90	33	65.0	4.82	
Stephens City †	91	35	65.4	5.62	
Sunbeam †	91	39	66.6	4.51	
Warrenton	90	40	66.2	5.13	
Warsaw †	93	38	65.0	3.94	
Westbrook Farm	93	39	66.3		
Westpoint	89	36	63.8	5.01	
Woodstock †	94	34	66.8	4.85	
Wytheville †	89	36	64.4	4.41	
Washington.					
Aberdeen	89 ^h	34	53.8 ^h	3.35	
Anacortes				1.53	
Ashford †				3.26	
Blaine †	81	27	51.8	1.50	
Brinnon	82	40	56.2	2.57	
Centerville †	81	24	53.3	0.38	
Clearwater	89	31	53.0	5.06	
Colfax	80	30	52.5	2.37	
Coupeville †	83	38	56.8	1.65	
Dayton	84	32	55.6	1.80	
Ellensburg	82	31	55.4	0.12	
Ellensburg (near)	90	30	56.9	0.27	
Fort Simcoe †	84	33	58.0	0.18	
Fort Spokane	83	30	53.7	2.30	
Grandmound †	88	31	54.4	1.79	
Hunters †	75	26	50.1	3.62	
Kennewick †	92	37	63.4	0.37	
Lacenter	87	35	55.1	3.02	
Lakeside	82	35	60.9	0.91	
Lapush	62	38	49.8	3.29	
Lind	92	30	59.4	1.37	
Loomis †	85	32	58.9	4.75	
Madrone †	82	37	54.8	1.13	
Moxee Valley †	88	29	58.2	0.49	
New Whatcom	76	35	53.6	1.68	
Olga	75	36	53.0	0.96	
Olympia †	90	35	55.0	1.96	
Oreca Island	74	36	56.0	0.82	
Pinehill †	84	32	55.7	0.96	
Pomeroy	82	37	58.2	2.16	
Port Townsend	81	41	54.5	1.85	
Pullman †	81	33	52.0	1.94	
Rosalia †	80	31	52.4	2.53	
Sedro †	86	34	58.5	1.79	
Shoalwater Bay * ¹⁰	72	41	55.0		
Snohomish †	86	37	60.0	2.13	
Southbend	90	35	54.6	3.33	
Stampede	76	32	50.0	1.48	
Washington—Cont'd.					
Stillaguamish	86	32	55.0	1.58	
Sunnyside †	81	31	59.2	0.73	
Union City †	85	35	55.4	1.36	
Vancouver	87	33	55.0	2.42	
Vashon †	82	38	55.0	0.93	
West Virginia.					
Beckley	81	31	60.2	3.70	
Beverly †	90	38	59.5	6.15	
Buckhannon †	89	37	62.2	5.13	
Burlington †	89	31	63.0	4.78	
Charleston †	89	30	61.2	4.34	
Dayton †	94	40	67.6	4.85	
Elkhorn †	86	34	64.3	5.07	
Fairmont †	86	35	62.6	4.01	
Glenville †	87	33	62.0	4.73	
Grafton †	86	31	60.7	3.60	
Green Sulphur				6.51	
Harpers Ferry				4.44	
Hinton †	91	38	65.2		
Huntington	90	32	62.4	3.63	
Kingwood	84	31	60.4	5.55	
Marlinton †	86	31	60.0	5.27	
Martinsburg †	89	33	62.3	4.51	
Morgantown †	87	32	62.6	4.78	
New Cumberland	87	33	62.4		
New Martinsville	89	32	63.8	4.54	
Nuttallburg	87	31	62.4		
Oldfields †	88	32	63.6	5.63	
Phillipi	89	32	63.2	5.84	
Point Pleasant †	92	38	66.0	3.51	
Powellton	89	34	64.4	3.85	
Romney	87	35	64.0	4.51	
Rowlesburg †				4.73	
Upper Tract	90	30	64.3	4.20	
Weston †				3.42	
Weston † ¹	70	35	64.2		
Wheeling †				3.63	
Wheeling †	87	46	65.8	3.69	
White Sulphur Springs	88			4.56	
Wisconsin.					
Amherst	79	28	56.2	2.40	
Antigo				2.84	
Barron	76	26	49.6	4.40	
Bayfield	78	31	51.3	2.50	
Beloit	77	34	58.4	3.45	
Brotherhood	82	33	56.8	2.29	
Butternut	89	25	54.3	1.27	
Chilton	79	34	56.9	3.70	
Citypoint	86	34	60.8	1.58	
Delavan	79	30	56.4	2.77	
Dodgeville †	80	31	57.1	5.30	
Easton	81	28	57.0	1.88	
Eau Claire	84	32	57.2	1.96	
Florence †	88	24	51.8	3.34	
Fond du Lac	82	31	56.2	3.12	
Grand River Locks				3.49	
Grantsburg †	84	23	53.8	4.85	
Gratiot	83	27	56.9	3.08	
Hartford				3.66	
Hartland	79	32	56.8	1.92	
Harvey	80	31	57.0	3.06	
Hayward	87	30	55.3	5.07	
Heafford Junction * ¹	88	38	54.2	1.91	
Hillsboro	80	31	56.8	1.43	
Kenosha * ¹⁰	78	40	55.1		
Knapp	89	29	55.8	2.67	
Koepenick * ¹	80	34	57.1	3.80	
Lancaster †	85	32	58.4	3.33	
Lincoln	78 ¹	34 ¹	53.2 ¹	3.28	
Madison †	78	38	57.5	4.71	
Manitowoc †	80	34	52.8	2.86	
Meadow Valley †	82	31	56.2	1.32	
Medford †	85	25	53.7	1.18	
Menasha				2.63	
Neillsville	78	30	55.6	1.58	
New Holstein	78	32	53.6	2.34	
New London	80	31	55.7	3.14	
North Crandon	86			1.40	
Oconto	80	31	55.6	4.37	
Oscoda †	87	26	54.8	6.60	
Pepin	84	30	56.6	1.38	
Pine River †	83	31	57.0	1.95	
Portage †	81	30	56.8	2.70	
Port Washington	82	32	53.6	2.68	
Prairie du Chien	89	36	61.1	2.03	
Prentice * ¹	80 ¹	32 ¹	53.5 ¹	4.32	
Racine	83	37	55.4	1.81	
Sharon	79			2.41	
Shawano	82	30	55.2	2.46	
Sheboygan * ¹⁰	82	40	55.2		
Spooner	82	33	54.0	3.39	
Stevens Point †	81	32	56.6	2.30	
Sturgeon Bay Canal * ¹⁰	75	34	49.9		
Two Rivers * ¹⁰	76	40	53.1		
Wisconsin—Cont'd.					
Valley Junction †	80	30	56.6	1.95	
Viroqua	80	36	57.8	2.04	
Watertown †	79	31	56.3	4.32	
Waukesha †	78	33	56.4	1.92	
Waupaca †	82	30	57.7	2.88	
Wausau †	78	28	54.6	2.55	
Westbend	78	32	54.4	2.71	
Westfield †	81	31	57.4	1.60	
Whitehall	82	29	56.8	2.00	
White Mound †	84	28	58.5	3.85	
Wyoming.					
Basin				2.28	
Big Horn Ranch	70	18	42.4	5.03	
Big Piney	73	20	45.2	1.46	
Carbon	82	22	47.7	2.95	
Embar	78	25	49.2		
Evanston	70	24	44.6	2.83	
Fort Laramie †	89	28	53.1	4.60	
Fort Washakie	78	27	47.8	5.77	
Fort Yellowstone †	73	23	45.0	1.95	
Laramie	73	20	44.1	1.88	
Lovell	80	31	54.2	4.83	
Lusk †	85	25	50.4	4.17	
Otto	82	25	51.0	5.05	
Sheridan	80	15	45.6	4.44	
Sundance	80	28	49.3	4.03	
Wheatland	84	25	52.2	4.33	
Mexico.					
Ciudad P. Diaz	96	58	80.4	1.27	
Leon de Aldamas	93	53	72.0	0.94	
Puebla	83	41	63.5	3.18	
Topolobampo * ¹	86	67	76.3	0.00	
New Brunswick.					
St. John's	67	30	49.8	1.79	

Late reports for April, 1898.

Arizona.				
Camp Creek	91	37	68.3	0.06
Arkansas.				
Forrest	80 ^f	30 ^f	57.2 ^f	1.35
California.				
Kernville				0.00
Milton (near) * ¹	95	45	62.2	0.57
Yuba City * ²	92	38	67.4	0.35
Colorado.				
Cope	83	22	49.9	1.97
Fort Morgan	90	18	50.1	0.81
Paonia				1.12
Georgia.				
Lumpkin	85	34	61.5	3.66
Idaho.				
Boise Barracks	92	29	53.0	0.81
Idaho City	76 ^f	16 ^f	46.3 ^f	0.15
Lost River	76 ¹	14 ¹	44.6 ¹	0.08
Illinois.				
Charleston	78	34	50.3	3.59
Grayville	80	30	55.1	5.70
Martinsville	79	24	50.8	2.48
Olney	81	24	51.7	5.00
Oswego * ¹	77	23	44.8	1.48
Robinson	79	24	51.2	4.84
Indiana.				
Algona	74	15	45.7	
Marengo				3.18
Iowa.				
Askaloosa				2.04
Louisiana.				
Oakridge	86			5.34
Michigan.				
Manistigee b	60	12	36.6	1.88
Mississippi.				
Columbus b	64	30	50.7	3.95
Missouri.				
Darksville	76	24	45.9	3.43
Montana.				
Billings	89	6	50.4	0.02
Choteau	82	1	43.3	1.06
Nebraska.				
Fairfield	88	34	57.4	5.40
Fremont				2.50
New Mexico.				
Galisteo	85	21	53.6	
Raton	82	18	51.0	0.49
North Carolina.				
Horse Cove	76	30	49.5	5.39
South Dakota.				
Aberdeen				1.32
Clark				0.49
Texas.				
Albany * ¹	86	38	65.2	1.46
Gollindo				3.50
Waco ⁴	85	40	62.8	1.76
Washington.				
Vancouver	81	29	51.2	

TABLE III.—Data furnished by the Canadian Meteorological Service, May, 1898.

Stations.	Pressure.			Temperature.				Precipitation.			Stations.	Pressure.			Temperature.				Precipitation.		
	Mean not reduced.	Mean reduced.	Departure from normal.	Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Total.	Departure from normal.	Depth of snow.		Mean not reduced.	Mean reduced.	Departure from normal.	Mean.	Departure from normal.	Mean maximum.	Mean minimum.	Total.	Departure from normal.	Depth of snow.
St. John's, N. F.	29.78	29.93	-.02	41.5	1.4	48.3	34.7	4.01	-.28	0.5	Saugeen, Ont.	29.23	29.95	-.01	52.2	1.5	61.7	42.9	1.86	-.07	...
Sydney, C. B. I.	29.96	30.00	+.04	45.6	0.8	54.8	36.3	1.51	-.28	0.5	Parry Sound, Ont.	29.23	29.93	-.03	54.1	3.0	64.5	43.7	2.70	-.02	...
Hallifax, N. S.	29.90	30.03	+.06	49.2	1.0	55.8	40.4	2.35	-.37	...	Port Arthur, Ont.	29.22	29.92	.00	47.9	2.0	57.7	38.2	3.06	+.08	...
Grand Manan, N. B.	29.93	29.98	.00	48.9	1.0	57.0	41.9	2.47	-.06	...	Winnipeg, Man.	29.18	29.97	+.08	51.8	3.4	67.0	36.6	0.38	-.12	...
Yarmouth, N. S.	29.92	30.00	+.02	48.6	1.6	56.4	40.6	2.36	-.79	...	Minneapolis, Minn.	27.72	29.95	+.07	51.0	1.2	65.8	36.3	0.45	-.07	...
Charlottetown, P. E. I.	29.95	29.99	+.03	48.5	3.2	62.1	41.2	1.91	-.99	...	Qu'Appelle, Assn.	27.64	29.90	+.04	54.8	0.7	68.4	41.2	0.48	-.08	...
Chatham, N. B.	29.95	29.97	+.02	51.7	2.2	55.3	37.1	3.90	+.56	...	Medicine Hat, Assn.	27.42	29.97	+.08	52.0	1.3	65.0	38.9	1.31	-.18	...
Father Point, Que.	29.61	29.94	-.01	53.6	3.7	62.1	45.2	3.55	-.43	...	Swift Current, Assn.	27.32	29.89	+.01	49.1	0.1	64.2	34.1	2.05	+.56	...
Quebec, Que.	29.72	29.92	.01	56.2	1.5	64.1	48.3	2.62	-.46	...	Calgary, Alberta	26.39	29.89	+.01	44.9	...	58.1	31.7	3.08	...	19.5
Montreal, Que.	29.39	29.90	-.04	55.7	3.8	68.4	43.0	2.83	+.23	...	Banff, Alberta	25.31	29.95	-.02	55.1	4.3	71.0	39.3	0.20	-.14	...
Rockliffe, Ont.	29.60	29.95	...	57.3	2.4	67.7	46.9	2.46	...	...	Edmonton, Alberta	27.59	29.85	...	52.1	4.5	67.4	36.8	0.51	...	...
Ottawa, Ont.	29.61	29.93	-.03	54.4	1.5	62.4	46.5	3.86	+.11	...	Prince Albert, Sask.	28.38	29.88	...	53.6	2.6	67.3	39.9	2.13	...	...
Kingston, Ont.	29.56	29.94	-.04	56.1	2.9	65.5	46.6	2.30	-.35	...	Battleford, Sask.	28.23	29.95	...	58.6	...	71.5	45.6	1.67	...	...
Toronto, Ont.	28.60	29.95	-.02	47.3	1.6	61.4	33.2	2.60	+.10	0.8	Kamloops, B. C.	28.60	29.86	...	54.7	2.7	64.5	44.9	0.60	...	...
White River, Ont.	28.60	29.95	...	47.3	1.6	61.4	33.2	2.60	...	...	Esquimalt, B. C.	29.92	29.95	...	68.3	1.1	73.6	62.9	1.65	...	...
Port Stanley, Ont.	29.31	29.95	-.03	54.4	1.3	63.4	45.4	2.24	-.00	...	Hamilton, Bermuda.	29.86	30.02	-.04	...	...	...	...	...	...	...

TABLE IV.—Mean temperature for each hour of seventy-fifth meridian time, May, 1898.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Bismarck, N. Dak.	49.6	48.4	47.0	45.6	44.4	43.6	42.8	44.9	48.0	52.1	55.5	57.9	59.5	60.2	61.5	62.5	63.0	62.9	62.3	61.2	58.8	55.6	53.8	51.7	53.9
Boston, Mass.	51.6	51.1	50.7	50.2	50.1	50.5	52.4	54.0	56.0	57.0	57.7	58.1	58.8	59.7	60.0	60.1	59.7	58.2	56.8	55.6	54.6	53.9	52.9	52.2	55.1
Buffalo, N. Y.	54.2	53.3	52.3	51.7	51.5	52.0	53.5	54.4	56.5	57.9	59.2	59.9	60.4	60.3	60.7	60.5	59.8	58.5	57.7	57.4	56.4	56.3	55.5	55.1	56.5
Chicago, Ill.	54.6	54.3	53.7	53.1	53.0	52.5	52.0	53.4	54.0	55.3	56.7	58.0	58.7	59.7	60.3	60.9	61.3	61.5	61.4	60.5	59.5	58.9	57.6	57.3	57.6
Cincinnati, Ohio	61.2	60.4	59.6	58.7	57.8	57.3	57.4	59.9	62.0	64.6	66.9	68.5	70.0	71.0	71.8	72.2	72.3	71.7	70.1	68.2	66.8	65.4	63.8	62.5	65.0
Cleveland, Ohio	56.6	55.7	54.5	53.9	53.1	52.6	53.1	55.0	56.2	57.5	58.1	58.7	58.8	59.7	60.3	60.9	61.3	61.5	61.4	60.5	59.5	58.9	57.6	57.3	57.6
Detroit, Mich.	54.3	53.6	52.6	52.0	51.8	52.1	53.1	54.9	57.3	59.1	61.2	62.4	63.4	64.6	65.5	65.9	65.2	64.6	62.8	61.3	59.7	57.6	56.7	55.5	58.6
Dodge City, Kans.	56.3	55.7	54.9	54.2	53.3	52.6	51.5	52.8	55.4	58.7	61.2	64.0	66.5	68.1	69.7	70.5	71.1	71.0	69.5	67.7	64.7	61.9	59.9	58.2	61.2
Eastport, Me.	43.6	43.3	43.1	42.8	42.7	43.1	44.2	45.6	47.3	48.6	50.1	50.7	51.4	51.9	52.2	52.3	50.7	49.6	48.2	47.2	46.2	45.5	44.9	44.4	47.1
Galveston, Tex.	73.9	72.9	72.5	72.2	71.9	71.8	72.3	73.0	73.8	74.6	75.8	76.7	76.9	77.8	77.3	77.3	77.0	76.3	75.6	74.5	74.2	73.9	73.7	74.6	74.6
Havre, Mont.	49.2	48.1	46.7	45.5	44.2	43.0	42.4	43.4	45.4	48.0	51.7	54.1	56.3	57.8	59.1	60.8	61.0	61.3	61.3	60.6	59.3	57.2	55.1	50.9	52.5
Kansas City, Mo.	60.8	60.3	59.5	58.8	58.3	57.9	57.5	58.4	60.8	62.5	64.6	66.7	68.0	68.9	70.3	71.0	71.4	70.5	69.3	68.1	66.1	64.6	63.4	62.5	64.2
Key West, Fla.	75.9	75.6	75.3	75.3	75.4	75.3	76.8	77.6	78.9	79.8	80.5	80.8	81.4	81.3	81.2	80.7	80.1	79.2	78.1	77.5	77.0	76.8	76.6	76.3	78.1
Memphis, Tenn.	70.8	69.6	68.5	67.5	66.7	65.7	65.3	67.0	68.9	71.1	73.2	75.4	77.1	78.7	80.1	82.0	83.0	83.8	81.5	79.6	77.4	75.8	74.3	73.0	75.2
New Orleans, La.	70.7	69.9	69.1	68.5	68.1	67.8	68.3	70.2	73.1	75.6	78.1	80.1	81.2	82.1	82.5	83.0	83.4	83.7	81.5	79.6	77.2	75.9	74.2	72.7	75.2
New York, N. Y.	53.2	53.1	52.6	52.2	51.7	51.9	52.7	54.0	55.5	56.3	57.5	58.5	59.4	59.7	60.2	60.1	59.4	57.9	56.8	55.7	55.1	54.8	54.1	53.0	55.7
Philadelphia, Pa.	55.8	55.4	55.0	54.6	54.4	54.6	55.9	58.1	60.0	61.4	63.0	64.7	66.5	67.6	68.1	68.3	67.0	65.4	63.8	61.8	59.3	56.2	54.4	56.6	60.5
Pittsburg, Pa.	59.7	58.5	57.5	56.8	56.2	55.8	56.4	58.6	61.0	63.8	65.8	67.4	68.5	69.2	69.0	70.1	69.9	69.3	68.1	66.0	64.5	63.5	62.3	61.2	63.3
Portland, Oreg.	55.6	54.5	53.0	51.9	51.1	50.2	49.4	48.8	48.3	50.2	52.1	54.4	56.8	58.7	60.3	61.6	62.7	63.2	63.6	63.6	62.7	61.3	59.1	57.2	56.3
St. Louis, Mo.	63.8	63.0	62.2	61.3	60.5	60.2	60.2	61.7	63.2	65.2	67.7	70.0	71.5	72.7	73.3	73.6	74.4	73.4	72.0	70.2	68.1	65.8	64.6	66.9	66.9
St. Paul, Minn.	54.8	53.5	52.1	51.4	50.4	49.8	49.5	50.8	52.8	55.4	57.9	60.0	62.3	63.7	65.1	65.8	66.4	66.0	65.1	64.0	62.3	60.3	58.0	56.5	58.1
Salt Lake City, Utah	51.6	50.5	49.8	48.9	48.1	47.5	46.6	47.3	48.8	51.3	53.7	56.2	58.2	59.2	60.5	61.9	62.1	62.1	61.1	60.0	58.0	56.5	54.0	52.5	54.0
San Diego, Cal.	57.3	57.1	56.7	56.5	56.1	55.8	55.7	55.6	55.7	56.3	56.8	57.2	57.6	58.2	58.7	59.0	59.0	60.1	60.6	60.1	60.0	59.8	59.9	59.3	58.6
San Francisco, Cal.	50.2	49.8	49.6	49.1	49.0	48.9	49.0	49.2	49.0	49.7	50.9	52.1	53.4	54.7	55.5	55.3	56.0	55.9	55.0	54.1	53.2	52.3	51.3	50.9	51.8
Savannah, Ga.	69.5	68.9	68.2	67.3	66.4	65.1	71.0	75.4	78.7	81.4	83.6	84.3	84.7	85.4	85.4	81.8	80.2	77.7	76.2	74.5	72.9	71.8	71.3	70.4	74.7
Washington, D. C.	59.1	58.1	57.2	56.5	56.2	56.4	58.0	60.5	62.6	64.5	66.8	68.8	70.3	71.9	72.4	71.9	71.1	69.8	67.3	65.1	63.2	62.1	61.4	60.2	63.8

TABLE V.—Mean pressure for each hour of seventy-fifth meridian time, May, 1898.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Bismarck, N. Dak.	28.212	.215	.216	.218	.222	.225	.232	.240	.242	.238	.231	.227	.217	.208	.196	.187	.178	.172	.166	.167	.175	.181	.191	.195	.206
Boston, Mass.	29.826	.822	.823	.830	.837	.845	.850	.852	.850	.851	.844	.836	.828	.820	.813	.812	.814	.820	.836	.852	.841	.837	.836	.834	.832
Buffalo, N. Y.	29.098	.095	.097	.097	.101	.112	.121	.136	.136	.135	.122	.117	.110	.104	.098	.091	.087	.086	.088	.090	.101	.103	.103	.099	.104
Chicago, Ill.	29.069	.063	.061	.069	.067	.073	.083	.095	.097	.095	.092	.090	.086	.083	.075	.074	.071	.066	.063	.059	.066	.073	.076	.070	.075
Cincinnati, Ohio	29.284	.280	.281	.282	.286	.295	.305	.314	.314	.313	.311	.306	.292	.281	.270	.264	.262	.262	.266	.271	.275	.283	.284	.282	.286
Cleveland, Ohio	29.129	.124	.122	.124	.129	.136	.145	.152	.152	.149	.147	.147	.143	.135	.126	.122	.118	.113	.115	.118	.122	.126	.126	.126	.131
Detroit, Mich.	29.330	.316	.311	.310	.309	.316	.325	.335	.338	.345	.345	.345	.335	.324	.311	.299	.285	.279	.274	.275	.284	.301	.317	.323	.313
Dodge City, Kans.	29.877	.875	.875	.880	.886	.896	.903	.905	.906	.905	.900	.895	.889	.882	.877	.874	.874	.877	.884	.888	.892	.890	.887	.886	.888
Eastport, Me.	29.925	.916	.912	.911	.913	.917	.927	.936	.946	.951	.956	.958	.953	.943	.928	.918	.909	.900	.894	.897	.909	.918	.925	.926	.924
Galveston, Tex.	29.320	.321	.320	.318	.330	.321	.325	.336	.327	.329	.327	.322	.317	.311	.304	.297	.290	.282	.279	.277	.282	.289	.301	.308	.309
Havre, Mont.	29.320	.321	.320	.318	.330	.321	.325	.336	.327	.329	.327	.322	.317	.311	.304	.297	.290	.282	.279	.277	.282	.289	.301	.308	.309
Kansas City, Mo.	28.995	.917	.913	.911	.915	.923	.935	.946	.952	.955	.952	.950	.943	.933	.912	.904	.895	.893	.891	.895	.903	.908	.922	.921	.921
Key West, Fla.	30.019	.008	.001	.003	.010	.019	.025	.028	.037	.039	.040	.034	.023	.005	.991	.981	.975	.977	.988	.004	.010	.019	.024	.022	.012
Memphis, Tenn.	29.541	.534	.530	.539	.541	.552	.565	.574	.568	.586	.587	.583	.572	.558	.544	.533	.520	.514	.512	.514	.526	.536	.541	.540	.546
New Orleans, La.	29.961	.954	.952	.954	.961	.971	.984	.990	.999	.996	.994	.985	.970	.950	.942	.930	.925	.923	.929	.937	.949	.960	.963	.958	.960
New York, N. Y.	29.612	.606	.605	.608	.613	.623	.632	.641	.644	.645	.635	.629	.619	.605	.597	.588	.584	.594	.594	.610	.616	.629	.633	.634	.629
Philadelphia, Pa.	29.830	.825	.820	.822	.829	.838	.848	.852	.856	.857	.850	.841	.830	.818	.808	.804	.804	.804	.810	.816	.829	.833	.834	.830	.829
Pittsburg, Pa.	29.072	.068	.065	.067	.073	.081	.090	.094	.094	.092	.089	.081	.068	.061	.050	.040	.035	.035	.049	.056	.065	.069	.073	.070	.068
Portland, Oreg.	29.818	.825	.832	.834	.834	.835	.835	.837	.841	.844	.848	.846	.842	.837	.827	.818	.809	.800	.789	.778	.778	.780	.789	.802	.820
St. Louis, Mo.	29.335	.331	.333	.335	.336	.350	.367	.369	.374	.373	.374	.371	.363	.354	.338	.329	.323	.311	.311	.312	.321	.334	.336	.338	.342
St. Paul, Minn.	29.018	.018	.015	.016	.023	.028	.037	.044	.048	.049	.045	.040	.030	.021	.009	.000	.000	.000	.006	.005	.000	.002	.011	.016	.019
Salt Lake City, Utah	25.541	.542	.539	.537	.538	.539	.538	.555	.564	.569	.569	.567	.566	.561	.557	.556	.546	.537	.534	.529	.533	.533	.545	.547	.548
San Diego, Cal.	29.876	.877	.873	.868	.862	.858	.855	.858	.867	.875	.887	.889	.885	.868	.865	.859	.853	.856	.854	.855	.851	.869	.878	.871	
San Francisco, Cal.	29.896	.836	.835	.830	.829	.830	.829	.834	.844	.851	.860	.865	.869	.871	.862	.857	.848	.838	.829	.822	.820	.823	.831	.840	.841
Savannah, Ga.	29.904	.900	.902	.905	.916	.922	.941	.945	.948	.947	.939	.925	.910	.891	.874	.864	.862	.864	.872	.880	.892	.900	.903	.903	.905
Washington, D. C.	29.822	.818	.814	.814	.825	.837	.844	.850	.852	.851	.846	.835	.825	.812	.796	.784	.769	.762	.762	.762	.762	.762	.762	.762	.762

May, 1898.

MONTHLY WEATHER REVIEW.

233

TABLE VI.—Average wind movement for each hour of seventy-fifth meridian time, May, 1898.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Abilene, Tex.	12.6	12.6	12.2	11.3	10.6	9.8	10.2	9.9	11.6	12.8	13.3	13.5	14.0	13.5	14.0	14.0	14.5	14.5	15.1	14.2	11.5	10.0	10.6	11.0	12.4
Albany, N. Y.	5.9	5.4	5.2	5.1	5.2	5.5	5.7	6.7	7.3	8.0	8.6	9.3	9.3	9.4	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0	9.0
Alpena, Mich.	7.2	6.8	7.1	6.8	6.5	6.5	7.3	8.5	9.5	10.1	11.2	11.8	12.4	12.6	12.8	13.3	12.5	11.2	10.2	8.1	6.7	6.8	6.9	7.0	9.2
Amarillo, Tex.	19.2	18.4	18.4	17.9	16.3	14.6	14.4	15.3	17.9	18.3	19.5	19.2	19.1	18.2	18.7	19.3	20.5	20.6	20.0	19.4	16.6	18.8	19.9	20.0	18.3
Atlanta, Ga.	8.0	8.2	8.1	8.2	8.4	8.1	7.2	7.3	7.9	7.8	8.6	9.4	10.3	10.8	11.3	11.2	10.9	10.4	9.3	8.1	8.2	8.7	8.4	8.0	8.9
Atlantic City, N. J.	10.8	10.2	9.9	9.5	9.5	9.5	10.2	11.2	11.6	12.2	12.6	12.3	12.6	12.5	12.8	12.8	12.1	11.9	11.6	10.4	10.3	9.9	10.7	10.6	11.2
Augusta, Ga.	4.5	4.3	4.4	4.5	3.9	3.7	3.6	4.7	5.2	6.0	7.2	7.4	8.3	8.8	9.9	9.9	9.5	8.8	7.7	6.5	5.5	5.0	4.7	4.8	7.0
Baker City, Oreg.	4.4	4.0	3.9	5.5	5.5	5.5	6.1	5.9	5.5	5.1	5.4	5.9	7.2	8.0	8.2	9.5	10.0	9.8	9.5	9.0	8.5	7.3	5.2	4.8	6.2
Baltimore, Md.	4.1	4.0	4.0	4.3	4.1	4.6	5.7	5.8	6.1	6.2	6.6	6.6	6.5	7.1	7.5	7.5	7.6	6.5	5.8	5.4	5.2	5.0	4.8	5.7	8.9
Bismarck, N. Dak.	7.2	7.0	6.5	6.5	6.0	6.1	6.2	6.7	7.7	9.3	10.6	11.4	12.5	12.5	12.8	12.9	13.4	13.0	12.9	11.4	9.0	7.9	8.2	7.5	9.4
Block Island, R. I.	13.0	12.9	12.4	12.5	12.7	13.2	13.8	14.0	14.2	14.3	14.1	14.4	15.9	15.6	14.9	14.6	14.4	14.2	14.4	14.5	14.1	14.3	13.5	13.8	14.0
Boston, Mass.	9.5	9.6	9.6	10.5	10.1	10.2	10.7	11.2	11.0	11.2	12.0	13.0	12.5	12.5	11.9	12.1	12.0	11.2	10.5	9.7	9.4	9.1	8.8	8.7	10.7
Buffalo, N. Y.	10.1	10.6	10.7	10.0	9.4	9.2	9.4	9.3	10.8	10.9	11.5	12.5	13.2	14.4	14.0	14.0	13.9	13.7	12.9	11.5	10.8	10.9	10.5	10.5	11.5
Calo, Ill.	6.5	6.6	7.0	7.5	7.6	6.4	6.9	7.5	8.5	9.7	9.8	10.5	10.6	10.4	10.6	10.5	9.7	10.1	9.0	8.2	7.1	7.9	7.0	6.8	8.3
Cape Henry, Va.	11.1	11.3	10.5	10.7	10.8	11.1	10.9	10.9	11.4	12.0	12.3	12.8	12.7	12.9	12.3	12.6	13.5	13.9	12.4	12.0	12.2	12.4	12.1	11.6	11.9
Carson City, Nev.	7.7	7.0	5.6	5.2	4.5	4.0	4.0	4.7	4.5	4.9	5.9	6.9	8.4	9.7	10.8	12.6	13.9	14.4	14.3	14.5	14.1	14.3	13.5	13.8	14.0
Charleston, S. C.	8.9	8.1	7.6	7.6	7.5	7.5	8.5	9.7	9.9	9.8	10.2	10.2	14.1	15.0	15.2	14.7	14.9	13.3	12.0	9.9	9.6	9.1	8.8	8.7	10.7
Charlotte, N. C.	5.8	5.5	5.6	4.9	5.1	4.8	5.1	5.8	6.7	6.6	6.9	7.4	7.8	8.6	9.2	9.1	9.2	9.4	7.1	6.3	6.3	6.2	6.3	6.1	10.6
Chattanooga, Tenn.	3.9	3.7	4.2	4.0	3.7	4.5	4.7	5.3	6.3	6.8	8.6	9.3	10.3	10.5	10.8	10.9	11.8	10.3	9.1	6.9	6.2	5.1	5.2	4.1	6.9
Cheyenne, Wyo.	9.1	9.5	9.0	8.6	8.8	8.5	8.6	9.6	11.1	12.1	12.3	13.3	13.4	14.3	14.3	14.7	14.8	14.9	14.6	13.7	11.1	9.9	9.0	11.6	11.9
Chicago, Ill.	15.4	16.5	17.4	17.8	17.9	17.9	17.4	16.9	16.9	16.7	17.7	18.0	19.3	19.2	19.3	19.2	18.9	18.6	17.7	14.9	14.0	15.4	14.7	15.3	17.2
Cincinnati, Ohio	5.4	5.5	5.2	5.0	5.2	5.1	5.3	6.7	8.0	9.0	10.2	11.1	11.9	12.2	12.1	12.1	11.6	11.4	10.1	7.9	6.6	6.0	5.4	4.9	8.1
Cleveland, Ohio	10.3	11.7	11.3	10.9	10.9	11.1	11.4	11.9	12.6	13.2	13.8	14.3	14.5	13.1	12.7	12.3	11.8	11.3	10.7	10.1	9.6	9.7	10.4	11.6	11.6
Columbia, Mo.	7.7	6.9	6.4	6.5	6.7	7.0	7.7	7.5	8.0	9.0	9.2	9.5	9.8	9.4	9.8	10.2	9.5	9.8	9.5	8.0	7.1	7.6	7.0	8.2	7.5
Columbus, Ohio	6.0	5.8	5.8	5.7	5.3	5.7	6.1	6.4	7.3	8.6	8.9	9.1	10.0	10.1	10.3	10.7	10.0	9.0	8.4	6.2	6.2	6.3	6.2	6.0	7.5
Concordia, Kans.	5.7	5.8	5.3	5.1	5.7	5.9	5.9	6.4	7.3	8.5	8.7	9.5	9.8	9.7	9.9	9.9	9.8	9.4	9.3	8.3	6.2	4.9	5.1	5.5	7.4
Corpus Christi, Tex.	16.5	15.8	14.7	14.7	14.1	13.4	13.6	13.7	14.3	15.3	16.0	16.9	17.8	18.5	18.4	19.2	19.7	20.2	19.7	18.8	18.1	17.6	16.8	15.8	16.7
Davenport, Iowa	7.0	6.6	6.9	6.1	6.1	5.6	6.6	6.9	7.5	8.5	8.9	9.1	9.8	9.7	10.0	10.4	9.8	9.1	7.7	6.8	6.5	5.5	6.1	6.7	7.6
Denver, Colo.	7.8	6.4	6.2	5.2	5.2	5.5	5.4	5.0	4.4	4.9	5.6	6.6	8.1	8.7	8.8	10.3	10.1	10.4	10.2	9.2	9.9	9.7	7.7	7.9	8.1
Des Moines, Iowa	6.5	6.3	6.4	6.0	5.4	5.5	6.5	7.4	8.2	9.3	9.9	9.9	10.1	10.0	10.3	10.3	9.8	9.9	9.5	8.4	6.2	6.2	6.3	6.2	7.5
Detroit, Mich.	7.0	7.0	7.1	7.1	7.1	6.7	6.7	7.5	8.3	8.8	10.0	10.6	11.2	11.3	11.2	11.2	11.5	11.1	10.0	8.7	7.7	7.6	7.5	7.0	8.7
Dodge City, Kans.	9.8	10.0	11.2	10.8	10.8	10.4	10.6	10.8	11.4	13.3	13.4	13.8	14.0	14.4	14.6	14.3	14.4	14.1	14.3	13.3	10.9	10.0	10.5	10.5	12.1
Dubuque, Iowa	5.4	5.4	5.3	5.4	5.4	5.0	4.9	6.1	7.7	8.1	8.8	9.6	10.0	10.2	10.8	10.6	10.4	10.5	10.0	9.5	7.9	7.1	6.2	5.8	7.3
Duluth, Minn.	8.0	8.0	7.9	8.5	9.0	10.2	11.4	10.1	9.1	9.3	10.0	9.9	10.5	10.5	10.8	10.4	10.4	10.5	10.0	9.5	7.9	7.1	7.9	8.1	9.3
Eastport, Me.	7.9	7.3	7.0	7.3	6.5	6.9	6.7	6.8	7.8	8.4	8.7	9.0	9.6	10.4	10.2	10.0	10.3	9.8	9.5	7.8	6.9	6.0	5.9	6.0	7.9
El Paso, Tex.	12.4	11.3	11.5	11.5	12.6	11.3	10.8	9.5	8.6	10.3	11.5	12.9	13.7	14.0	14.5	15.2	16.0	17.0	16.4	16.5	16.2	13.4	13.0	11.9	13.0
Erie, Pa.	6.8	7.0	7.0	7.0	7.4	7.7	7.6	8.1	8.7	9.3	9.5	9.9	9.6	9.7	9.8	9.8	9.4	8.3	8.0	6.6	6.7	7.1	6.9	6.5	8.0
Eureka, Cal.	6.1	4.9	4.6	4.4	4.0	4.4	4.1	4.5	4.9	4.9	5.1	5.9	7.6	9.0	9.0	10.2	10.8	10.6	9.4	9.0	7.9	6.7	6.2	6.1	6.2
Evansville, Ind.	6.1	5.8	5.7	5.8	5.9	6.2	6.1	6.5	7.4	8.1	9.2	9.9	10.1	9.8	9.6	9.5	9.6	9.0	8.1	6.0	5.6	5.4	5.4	5.6	7.4
Fort Canby, Wash.	10.5	10.0	9.5	10.3	10.8	10.4	11.0	10.8	10.1	10.1	11.1	11.7	12.1	13.5	11.7	11.7	12.2	12.9	13.0	11.9	11.5	11.6	11.1	10.8	11.3
Fort Smith, Ark.	5.1	5.3	5.0	5.0	4.6	4.9	4.9	5.0	5.8	6.4	6.8	7.5	7.6	8.4	8.7	8.5	9.3	7.9	7.3	6.4	5.3	5.2	4.7	5.1	6.3
Fresno, Cal.	9.4	8.8	8.2	7.4	6.7	6.0	5.8	5.2	4.7	5.6	6.5	6.1	5.8	5.5	5.7	5.8	5.5	5.4	5.7	6.0	7.2	7.3	7.7	9.1	6.5
Galveston, Tex.	11.5	11.4	11.4	10.9	10.7	11.0	11.2	11.5	12.2	12.3	12.3	11.7	12.0	12.9	12.9	13.6	14.0	13.8	12.5	11.7	11.2	11.6	11.2	11.7	11.7
Grand Haven, Mich.	7.0	7.4	7.5	7.7	7.9	7.7	8.2	9.2	10.1	10.6	11.1	11.7	12.0	12.9	12.9	13.4	12.0	11.0	9.9	9.2	7.5	6.9	6.6	6.7	7.9
Greenbay, Wis.	7.1	6.8	6.7	6.2	6.5	6.5	7.2	8.0	8.8	9.9	10.8	11.1	11.7	12.0	12.9	13.4	12.0	11.0	9.9	8.4	7.5	7.5	6.6	6.7	7.3
Hannibal, Mo.	8.2	8.5	8.7	8.4	8.4	8.1	7.9	8.8	9.4	9.0	9.7	10.8	11.1	11.3	10.8	11.1	11.7	10.9	10.1	8.8	7.4	7.2	7.0	7.1	9.2
Harrisburg, Pa.	4.9	4.8	4.9	4.7	4.4	5.4	5.7	6.0	6.7	7.0	6.9	7.1	7.3	8.1	8.1	7.9	7.8	8.2	7.5	6.1	5.6	4.8	4.9	4.5	6.2
Hatteras, N. C.	10.6	10.9	11.4	11.6	11.2	11.3	11.7	12.0	12.2	12.5	13.2	13.9	13.9	14.0	13.9	14.2	13.2	12.9	12.1	11.6	10.9	11.1	10.7	10.5	12.2
Havre, Mont.	6.9	8.0	9.5	9.4	11.1	11.2	11.3	10.1	11.5	12.9	14.0	14.9	15.4	15.8	15.7	15.2	15.1	14.3	13.8	12.6	10.4	8.8	7.9	11.9	7.5
Helena, Mont.	6.6	6.3	6.3	5.8	6.2	5.9	5.5	5.6	4.5	5.4	7.2	7.7	9.7	9.5	8.7	8.8	10.3	10.8	11.1	10.9	10.1	8.8	7.4	7.1	9.2
Huron, S. Dak.	9.9	10.5	10.6	10.1	10.2	9.6	9.5	10.0	10.8	11.4	12.1	12.3	13.6	14.3	14.9	14.4	14.5	14.2	13.5	11.8	9.7	9.4	10.0	9.5	11.5
Idaho Falls, Idaho	9.6	8.6	9.2	9.5	9.4	9.1	9.6	9.9	9.6	10.4	10.9	11.4	12.7	12.6	13.6	14.3	15.0	15.2	13.6	13.2	12.9	12.1	11.6	10.9	10.5
Independence, Cal.	10.5	10.1	8.8	8.1	8.9	8.7	8.3	7.8	7.2	8.2	9.5	10.2	10.3	10.9	11.7	13.6	14.0	13.8	14.1	13.8	14.0	12.2	10.9	10.8	10.7
Indianapolis, Ind.	8																								

MONTHLY WEATHER REVIEW.

234

TABLE VI.—Average wind movement, etc.—Continued.

Stations.	1 a. m.	2 a. m.	3 a. m.	4 a. m.	5 a. m.	6 a. m.	7 a. m.	8 a. m.	9 a. m.	10 a. m.	11 a. m.	Noon.	1 p. m.	2 p. m.	3 p. m.	4 p. m.	5 p. m.	6 p. m.	7 p. m.	8 p. m.	9 p. m.	10 p. m.	11 p. m.	Midnight.	Mean.
Oswego, N. Y.	8.7	8.6	8.8	8.6	8.5	8.5	8.8	9.3	9.6	10.1	9.9	10.0	10.4	11.0	10.2	9.8	9.8	8.9	8.7	8.2	8.0	8.6	8.7	8.4	9.2
Palestine, Tex.	7.3	7.1	6.7	6.0	6.1	6.1	6.2	6.3	7.3	8.4	8.9	9.7	10.2	10.2	10.3	10.0	9.6	9.5	8.5	7.1	6.3	6.5	6.8	6.9	7.8
Parkersburg, W. Va.	3.7	3.5	3.4	3.2	3.5	3.3	3.6	4.4	5.5	6.1	6.4	6.5	6.8	7.1	7.6	8.0	7.4	7.0	6.1	4.9	4.3	3.8	3.6	3.8	5.2
Pensacola, Fla.	8.0	7.9	7.4	7.2	6.7	5.7	5.2	5.4	6.9	7.7	8.3	9.3	11.1	12.7	13.7	14.2	14.3	13.5	12.2	10.9	9.0	8.2	7.9	8.1	9.2
Philadelphia, Pa.	8.0	8.1	8.5	7.6	8.6	8.6	9.2	10.8	11.5	11.1	10.8	10.3	11.3	11.4	11.6	11.5	11.2	10.9	9.5	8.8	9.5	9.3	8.8	8.2	9.8
Phoenix, Ariz.	2.8	3.0	2.5	2.8	3.1	3.8	3.8	4.0	3.8	4.3	4.8	4.5	5.1	5.5	5.7	6.0	6.3	6.5	6.6	6.0	4.8	3.9	3.5	3.0	4.4
Pierre, S. Dak.	7.6	8.0	8.0	7.9	7.4	7.7	7.0	7.2	8.3	9.0	9.5	10.4	10.8	11.7	12.4	13.0	12.8	12.6	12.0	11.9	10.7	9.5	8.5	7.2	9.6
Pittsburg, Pa.	3.9	3.8	3.6	3.4	3.8	3.6	3.9	4.5	5.8	6.6	7.1	7.3	7.5	7.8	7.9	7.6	8.1	7.8	6.2	5.5	5.3	5.0	4.6	4.1	5.6
Pt. Reyes Light, Cal.	26.5	26.1	24.5	24.0	24.2	22.5	22.1	22.6	22.1	21.7	21.2	19.7	19.3	19.7	19.9	21.1	22.9	24.1	24.6	20.9	28.1	28.5	28.1	27.3	23.6
Port Angeles, Wash.	5.7	6.1	6.1	6.2	5.7	5.2	5.2	5.5	5.3	5.4	3.9	5.3	6.0	5.9	6.3	6.5	6.7	7.3	8.2	8.1	7.8	7.0	6.0	6.0	6.1
Port Huron, Mich.	8.6	8.7	8.9	9.1	8.4	8.8	8.8	9.2	9.5	10.5	11.8	12.1	13.1	13.9	14.5	14.2	13.7	12.9	11.3	2.8	8.8	8.7	8.5	8.5	10.5
Portland, Me.	6.1	6.0	5.8	5.6	5.5	5.8	6.3	7.3	7.9	8.9	9.8	9.9	9.8	10.6	10.5	10.5	9.8	8.7	7.0	5.8	5.7	6.2	5.8	5.9	7.6
Portland, Oreg.	7.8	7.6	7.1	6.5	6.2	5.5	6.1	5.4	5.0	6.0	7.3	7.7	8.0	9.1	9.7	10.2	10.8	10.8	9.5	9.5	9.2	8.6	8.2	8.5	7.9
Pueblo, Colo.	8.1	6.7	7.3	6.1	5.5	5.4	5.1	4.2	4.4	4.7	6.0	7.4	8.3	8.8	9.8	10.9	11.4	12.5	13.1	13.4	11.8	10.0	8.9	7.8	8.2
Raleigh, N. C.	5.6	5.5	5.4	5.1	4.8	5.1	5.4	6.5	7.1	7.5	7.2	7.3	7.5	7.8	7.6	8.0	7.6	7.4	5.5	5.1	5.6	5.8	5.8	5.7	6.3
Rapid City, S. Dak.	7.1	6.9	6.5	6.3	6.2	6.2	6.8	7.0	7.1	7.1	8.6	8.8	9.9	9.5	9.2	10.1	10.0	10.4	10.4	10.4	8.8	6.9	6.0	6.1	8.0
Red Bluff, Cal.	6.9	6.7	5.8	5.8	6.0	5.6	5.5	5.7	5.1	5.8	7.0	7.5	8.1	8.2	8.8	8.7	8.5	8.3	9.3	9.2	9.1	8.8	7.5	7.7	7.2
Richmond, Va.	5.5	5.5	5.9	5.5	5.1	4.9	5.2	6.6	7.5	7.6	8.1	8.2	8.8	8.7	8.5	8.9	9.0	7.7	7.3	6.4	4.9	5.4	5.9	5.6	6.8
Rochester, N. Y.	5.6	5.7	5.9	5.7	5.5	5.9	5.8	6.3	7.0	6.9	7.0	7.4	8.0	8.2	8.7	9.0	8.3	7.4	6.1	5.9	5.5	5.3	5.8	6.0	6.6
Roseburg, Oreg.	2.7	2.1	2.2	2.3	2.1	2.0	1.7	1.5	1.4	1.7	2.2	3.1	3.5	4.5	5.2	6.5	6.7	7.0	7.8	8.3	7.8	6.7	4.9	3.5	4.1
Sacramento, Cal.	10.2	9.6	9.6	9.2	9.1	9.0	8.8	8.9	7.9	7.8	8.1	8.5	9.4	9.6	10.3	10.7	11.0	11.3	11.9	12.1	11.6	10.8	10.8	10.3	9.8
St. Louis, Mo.	8.0	7.7	8.5	8.4	9.1	8.9	8.5	8.9	9.7	10.2	10.7	10.9	11.3	11.1	11.0	10.8	11.0	10.3	9.2	9.6	8.2	6.8	6.5	6.1	7.5
St. Paul, Minn.	6.0	6.0	5.3	5.3	5.5	5.1	4.9	5.2	6.6	7.5	8.1	8.2	8.8	9.8	9.4	10.2	9.5	9.4	9.0	8.2	6.8	6.8	6.5	5.6	6.1
Salt Lake City, Utah.	4.9	4.7	4.1	4.4	4.2	4.5	3.8	4.5	4.7	5.2	5.9	6.5	7.7	8.8	9.6	9.3	8.9	7.4	6.1	5.9	5.5	5.3	5.8	5.6	6.1
San Antonio, Tex.	11.3	9.7	9.5	8.7	8.1	7.7	7.5	7.9	9.5	11.6	12.4	11.7	11.4	12.3	12.3	12.2	12.8	13.8	14.8	14.5	13.9	13.4	12.1	11.3	11.3
San Diego, Cal.	3.6	3.8	3.8	3.6	3.8	4.5	4.2	4.2	4.0	4.2	5.1	6.6	8.5	10.2	11.5	11.8	11.7	11.4	10.5	9.0	8.0	6.3	4.7	3.6	6.6
Sandusky, Ohio.	6.6	6.7	7.1	7.3	7.7	7.7	7.5	7.3	7.7	7.7	8.6	9.1	8.8	9.1	8.7	8.9	8.5	8.2	7.6	7.5	7.1	6.7	7.3	7.5	7.8
San Francisco, Cal.	12.7	11.7	10.6	10.2	9.1	8.9	8.3	8.1	7.6	7.9	8.8	9.5	10.8	12.8	15.8	18.2	18.7	19.3	20.8	20.5	19.4	18.6	16.0	13.9	13.3
San Luis Obispo, Cal.	3.5	3.3	3.3	3.5	3.3	3.3	3.2	2.8	3.2	3.5	3.9	4.8	5.4	7.0	8.3	9.4	10.3	10.3	14.1	13.7	12.7	9.6	7.0	6.3	5.6
Santa Fe, N. Mex.	5.5	5.2	5.1	4.8	4.6	3.9	4.0	4.0	5.1	6.2	8.3	9.5	10.6	12.3	13.3	13.8	14.2	14.1	13.7	12.7	9.6	7.0	6.3	5.6	8.3
Sault Ste Marie, Mich.	5.7	5.7	6.4	5.9	5.5	5.5	6.9	7.4	8.0	9.6	10.7	12.3	13.1	14.2	15.0	15.1	14.5	14.1	14.4	11.6	10.5	9.6	9.6	9.4	11.9
Savannah, Ga.	7.5	6.9	6.6	6.0	5.8	5.6	5.9	7.4	8.0	7.6	7.6	7.3	5.1	5.8	5.9	6.3	6.5	7.0	7.3	7.4	7.1	6.4	5.3	4.7	5.4
Seattle, Wash.	4.4	4.6	4.5	4.1	4.3	4.2	4.2	4.1	3.9	4.3	4.6	5.1	5.8	8.9	8.6	8.8	9.3	9.0	9.3	8.8	6.8	5.7	7.0	7.3	7.2
Shreveport, La.	7.1	6.5	5.8	5.8	5.6	5.4	5.5	5.9	6.7	7.2	7.7	8.3	8.9	15.1	15.5	15.4	14.5	14.1	14.4	11.6	10.5	9.6	9.6	9.4	11.9
Sioux City, Iowa.	10.2	9.0	9.2	9.0	9.5	9.9	11.0	10.5	10.9	12.7	13.2	14.2	15.8	15.1	15.5	15.4	14.5	14.1	14.4	11.6	10.5	9.6	9.6	9.4	11.9
Spokane, Wash.	5.4	5.6	4.7	4.6	4.8	5.2	5.2	5.5	5.3	6.3	7.4	8.0	9.4	9.9	10.0	10.3	10.3	10.2	10.0	9.4	8.6	7.2	5.9	5.0	7.3
Springfield, Ill.	7.6	7.2	7.3	7.4	7.6	7.5	7.7	7.9	9.5	10.8	10.8	11.3	12.3	12.5	11.6	10.9	11.5	1.1	11.4	11.2	10.0	9.5	7.3	7.3	6.7
Springfield, Mo.	8.9	9.0	9.6	9.0	9.1	9.2	8.2	8.7	9.3	10.1	11.3	12.2	12.5	11.6	10.9	11.5	1.1	11.4	11.2	10.0	9.5	7.3	7.3	6.7	6.5
Tacoma, Wash.	5.9	5.9	5.8	5.1	4.9	4.4	4.3	4.3	4.4	4.6	5.6	6.9	6.4	7.5	7.7	8.3	8.6	8.5	8.1	8.5	8.2	7.3	7.3	6.7	7.1
Tampa, Fla.	5.0	4.6	4.5	4.8	4.3	3.6	4.3	4.3	4.9	7.4	7.4	7.8	8.0	9.6	10.9	11.3	11.7	11.0	9.6	7.0	6.0	5.4	5.1	4.5	7.1
Tatoosh Island, Wash.	9.2	9.8	10.1	9.9	9.7	9.8	9.7	10.8	11.0	10.3	10.7	11.8	11.3	12.2	12.3	12.4	11.6	12.0	10.6	10.5	9.9	9.8	9.9	9.3	10.6
Toledo, Ohio.	7.1	7.0	7.3	7.0	7.2	7.3	7.4	7.9	9.1	9.7	10.5	10.8	11.4	11.3	10.8	10.5	10.8	10.7	10.6	10.0	9.1	7.8	7.1	7.7	7.0
Vicksburg, Miss.	6.5	6.2	6.1	5.9	5.7	5.8	5.6	5.7	6.5	7.0	7.6	8.0	8.9	9.3	9.1	9.0	8.2	7.4	6.5	5.4	5.3	5.2	5.6	6.0	6.8
Vineyard Haven, Mass.	7.9	8.1	7.7	7.4	7.5	8.0	8.7	9.5	10.3	10.5	11.0	10.8	11.6	11.4	11.0	9.8	9.5	8.4	8.0	7.8	7.7	7.7	7.9	7.8	9.0
Walla Walla, Wash.	5.5	5.9	6.3	5.4	5.8	5.4	4.7	4.8	5.2	5.2	6.7	7.4	7.2	7.6	7.6	8.2	8.5	8.5	7.9	7.9	7.6	6.1	5.5	6.3	6.5
Washington, D. C.	4.6	4.4	4.6	4.4	4.0	4.0	4.8	6.0	6.6	7.3	7.6	7.7	8.2	8.3	8.8	9.3	8.2	7.7	6.4	5.7	5.1	5.2	4.9	4.5	6.2
Wichita, Kans.	7.8	7.2	7.1	7.2	7.7	7.8	7.7	7.9	8.6	10.3	10.8	11.4	11.3	10.9	11.2	11.3	11.1	10.8	10.0	8.8	7.8	7.5	7.8	8.2	9.1
Williston, N. Dak.	6.1	5.7	5.9	5.5	6.0	5.8	5.5	4.9	5.7	6.6	7.6	8.3	9.8	10.7	10.5	9.6	9.0	9.8	9.3	9.6	8.5	6.8	6.8	6.0	7.5
Wilmington, N. C.	7.3	7.1	6.9	6.6	6.5	6.4	6.7	8.4	8.7	9.8	10.3	10.4	10.8	11.7	13.7	13.7	12.7	11.5	10.4	8.4	8.3	8.6	8.4	7.8	9.2
Winnemucca, Nev.	7.8	7.9	7.5	7.8	7.9	7.8	7.5	7.1	7.8	7.7	8.1	9.1	9.9	10.3	11.7	11.5	12.0	12.3	13.1	14.0	12.9	11.6	9.7	9.4	11.1
Woods Hole, Mass.	10.4	10.0	10.3	10.4	11.1	10.6	11.1	11.1	11.4	11.3	12.3	12.4	13.5	13.5	13.8	12.9	11.3	10.6	10.5	10.3	9.8	9.7	9.0	9.7	11.1
Yankton, S. Dak.	7.1	6.5	6.7	7.1	7.0	7.5	7.3	8.3	8.8	8.5	9.1	10.3	10.7	11.5	11.5	11.8	11.2	10.6	9.9	8.0	6.3	5.9	7.0	6.2	8.5

TABLE VII.—Resultant winds from observations at 8 a. m. and 8 p. m., daily, during the month of May, 1898.

Stations.	Component direction from—				Resultant.		Stations.	Component direction from—				Resultant.	
	N.	S.	E.	W.	Direction from—	Duration.		N.	S.	E.	W.	Direction from—	Duration.
<i>New England.</i>							<i>Upper Lake Region—Cont'd.</i>						
Eastport, Me.	22	23	15	15	s.	Hours.	Greenbay, Wis.	25	20	19	12	n. 54 e.	9
Portland, Me.	14	29	14	16	s. 8 w.	15	Duluth, Minn.	27	5	24	16	n. 30 e.	23
Northfield, Vt.	23	31	4	6	s. 11 w.	10	<i>North Dakota.</i>						
Boston, Mass.	21	20	30	13	n. 82 e.	7	Moorhead, Minn.	34	8	23	14	n. 19 e.	28
Nantucket, Mass.	18	28	18	14	s. 22 e.	11	Bismarck, N. Dak.	24	9	27	14	n. 41 e.	30
Woods Hole, Mass.*	6	15	12	6	s. 34 e.	11	Williston, N. Dak.	26	16	25	11	n. 54 e.	17
Block Island, R. I.	13	21	21	30	s. 7 e.	8	<i>Upper Mississippi Valley.</i>						
New Haven, Conn.	19	24	20	7	s. 69 e.	14	St. Paul, Minn.	22	14	30	19	n. 7 e.	8
<i>Middle Atlantic States.</i>							La Crosse, Wis.†	9	16	6	5	s. 16 e.	7
Albany, N. Y.	22	25	9	11	s. 34 w.	4	Davenport, Iowa	18	19	22	21	s. 45 e.	4
Binghamton, N. Y.†	12	10	10	6	n. 63 e.	4	Des Moines, Iowa	17	19	20	17	s. 56 e.	4
New York, N. Y.	22	19	28	7	n. 82 e.	21	Dubuque, Iowa	18	19	17	22	s. 79 w.	5
Harrisburg, Pa.	22	11	29	13	n. 56 e.	19	Keokuk, Iowa	24	18	22	16	n. 45 e.	8
Philadelphia, Pa.	20	21	26	9	s. 87 e.	17	Calro, Ill.	19	27	12	15	s. 21 w.	8
Atlantic City, N. J.	16	23	24	12	s. 60 e.	14	Springfield, Ill.	22	21	17	16	n. 45 e.	1
Cape May, N. J.	23	20	25	6	n. 81 e.	19	Hannibal, Mo.†	9	12	6	10	s. 53 w.	5
Baltimore, Md.	23	13	28	14	n. 54 e.	17	St. Louis, Mo.	24	19	16	15	n. 11 e.	5
Washington, D. C.	24	19	18	8	n. 63 e.	11	<i>Missouri Valley.</i>						
Lynchburg, Va.	22	23	18	16	s. 63 e.	2	Columbia, Mo.*	9	9	11	8	e.	3
Norfolk, Va.	17	25	23	13	s. 51 e.	13	Kansas City, Mo.	19	20	24	15	s. 84 e.	9
Richmond, Va.	25	20	15	16	n. 11 w.	5	Springfield, Mo.	15	27	19	18	s. 5 e.	12
<i>South Atlantic States.</i>							Lincoln, Nebr.	27	20	21	11	n. 55 e.	12
Charlotte, N. C.	9	32	22	10	s. 43 e.	18	Omaha, Nebr.	24	18	16	30	n. 34 w.	7
Hatteras, N. C.	19	25	15	12	s. 27 e.	7	Sioux City, Iowa†	14	9	12	8	n. 39 e.	6
Raleigh, N. C.	21	25	8	21	s. 73 w.	14	Pierre, S. Dak.	23	12	28	10	n. 59 e.	21
Wilmington, N. C.	8	28	12	14	s. 6 w.	20	Huron, S. Dak.	27	11	24	12	n. 37 e.	30
Charleston, S. C.	8	32	8	23	s. 32 w.	28	Yankton, S. Dak.†	11	5	10	11	n. 9 w.	6
Augusta, Ga.	14	29	12	17	s. 18 w.	16	<i>Northern Slope.</i>						
Savannah, Ga.	7	37	8	19	s. 20 w.	32	Havre, Mont.	14	13	32	14	n. 87 e.	18
Jacksonville, Fla.	6	34	21	16	s. 10 e.	28	Miles City, Mont.	23	11	21	30	n. 5 e.	12
<i>Florida Peninsula.</i>							Helena, Mont.	18	19	7	32	s. 88 w.	25
Jupiter, Fla.	3	23	30	13	s. 40 e.	26	Rapid City, S. Dak.	21	14	22	20	n. 16 e.	7
Key West, Fla.	12	14	41	8	s. 87 e.	33	Cheyenne, Wyo.	21	19	13	20	n. 74 w.	7
Tampa, Fla.	18	9	17	32	n. 59 w.	18	Lander, Wyo.	20	18	16	29	n. 81 w.	13
<i>Eastern Gulf States.</i>							North Platte, Nebr.	21	18	17	18	n. 18 w.	3
Atlanta, Ga.	17	18	8	35	s. 88 w.	27	<i>Middle Slope.</i>						
Pensacola, Fla.	11	30	4	32	s. 56 w.	34	Denver, Colo.	18	28	18	13	s. 27 e.	11
Mobile, Ala.	15	31	3	24	s. 53 w.	26	Pueblo, Colo.	21	15	22	16	n. 45 e.	8
Montgomery, Ala.	14	30	7	35	s. 78 w.	29	Concordia, Kans.	22	18	21	16	n. 59 e.	8
Vicksburg, Miss.	10	34	13	17	s. 9 w.	24	Dodge City, Kans.	23	21	19	13	n. 72 e.	6
New Orleans, La.	6	40	7	17	s. 16 w.	35	Wichita, Kans.	20	26	17	12	s. 40 e.	8
<i>Western Gulf States.</i>							Oklahoma, Okla.	13	35	15	7	s. 30 e.	23
Shreveport, La.	7	37	32	12	s. 34 e.	36	<i>Southern Slope.</i>						
Port Smith, Ark.	17	19	31	10	s. 85 e.	21	Ablene, Tex.	11	36	10	9	s. 2 e.	25
Little Rock, Ark.	13	29	19	13	s. 21 e.	17	Amarillo, Tex.	14	29	10	16	s. 22 w.	16
Corpus Christi, Tex.	6	37	41	1	s. 52 e.	51	<i>Southern Plateau.</i>						
Galveston, Tex.	4	46	18	6	s. 16 e.	44	El Paso, Tex.	13	12	10	40	n. 88 w.	30
Palestine, Tex.	9	45	8	6	s. 3 e.	36	Santa Fe, N. Mex.	12	25	17	24	s. 28 w.	15
San Antonio, Tex.	7	38	35	2	s. 47 e.	45	Phoenix, Ariz.	18	10	21	29	n. 45 w.	11
<i>Ohio Valley and Tennessee.</i>							Yuma, Ariz.	11	20	6	35	s. 73 w.	30
Chattanooga, Tenn.	21	30	9	28	n. 37 w.	19	Independence, Cal.	24	17	11	29	n. 69 w.	19
Knoxville, Tenn.	19	21	18	18	s.	2	<i>Middle Plateau.</i>						
Memphis, Tenn.	13	30	13	27	n. 62 w.	17	Carson City, Nev.	8	24	7	35	s. 60 w.	32
Nashville, Tenn.	23	15	12	37	n. 56 w.	4	Winnemucca, Nev.	17	25	11	23	n. 56 w.	14
Lexington, Ky.	21	23	15	18	s. 84 w.	9	Salt Lake City, Utah.	15	27	17	20	s. 14 w.	12
Louisville, Ky.	22	23	9	18	s. 37 e.	5	<i>Northern Plateau.</i>						
Evansville, Ind.†	8	12	10	7	n. 24 w.	10	Baker City, Oreg.	27	23	15	12	n. 37 e.	5
Indianapolis, Ind.	25	16	15	19	n. 23 e.	8	Idaho Falls, Idaho	16	34	7	13	s. 18 w.	19
Cincinnati, Ohio	27	20	15	12	n. 27 w.	7	Spokane, Wash.	15	26	23	13	s. 42 e.	15
Columbus, Ohio	26	20	12	15	n. 34 w.	19	Walla Walla, Wash.	10	34	12	13	s. 2 w.	24
Pittsburg, Pa.	31	15	7	21	n. 61 w.	10	<i>North Pacific Coast Region.</i>						
Parkersburg, W. Va.	23	18	12	21	n. 61 w.	10	Fort Canby, Wash.	20	20	12	19	w.	7
<i>Lower Lake Region.</i>							Port Angeles, Wash.*	13	0	8	18	n. 38 w.	16
Buffalo, N. Y.	10	26	16	23	s. 24 w.	18	Seattle, Wash.	20	26	11	14	s. 27 w.	7
Oswego, N. Y.	11	24	18	25	s. 28 w.	15	Tacoma, Wash.	21	21	5	29	w.	24
Rochester, N. Y.	17	19	17	29	s. 81 w.	12	Tatoosh Island, Wash.	4	30	16	18	s. 4 w.	26
Erie, Pa.	11	18	12	26	s. 63 w.	16	Portland, Oreg.	22	19	10	23	n. 77 w.	13
Cleveland, Ohio	27	22	14	15	n. 11 w.	5	Roseburg, Oreg.	30	13	18	16	n. 7 e.	17
Sandusky, Ohio	18	30	19	20	s. 27 w.	2	<i>Middle Pacific Coast Region.</i>						
Toledo, Ohio	16	30	16	18	s. 27 w.	4	Eureka, Cal.	22	18	10	22	n. 72 w.	13
Detroit, Mich.	22	18	14	21	n. 60 w.	8	Redbluff, Cal.	23	16	16	14	n. 16 e.	7
<i>Upper Lake Region.</i>							Sacramento, Cal.	7	43	8	23	s. 22 w.	39
Alpena, Mich.	22	21	18	20	n. 63 w.	2	San Francisco, Cal.	1	23	3	46	s. 63 w.	48
Grand Haven, Mich.	22	19	12	22	n. 73 w.	10	<i>South Pacific Coast Region.</i>						
Marquette, Mich.	26	14	10	27	n. 55 w.	21	Fresno, Cal.	28	10	5	39	n. 62 w.	38
Port Huron, Mich.	29	23	6	8	n. 18 w.	6	Los Angeles, Cal.	2	27	6	30	s. 44 w.	35
Sault Ste. Marie, Mich.	18	8	21	29	n. 39 w.	13	San Diego, Cal.	21	13	5	37	n. 76 w.	33
Chicago, Ill.	25	21	18	13	n. 51 e.	6	San Luis Obispo, Cal.	16	7	2	44	n. 78 w.	43
Milwaukee, Wis.	29	15	20	15	n. 20 e.	15							

* From observations at 8 p. m. only.

† From observations at 8 a. m. only.

TABLE VIII.—Thunderstorms and auroras, May, 1898.

States.	No. of stations.																																Total.			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	No.	Days.		
Alabama.....	55	T.				1	3							3	3			1			2	1	2	1	6	5		1	5		4	1	39	15	T.	
Arizona.....	56	A.	1	1	3	3			1										1														16	6	A.	
Arkansas.....	59	T.	14	10	11	12	13	2			2		4	1			3	1		14	11	10	2		3	1		5		5	3		127	20	T.	
California.....	180	A.				1		3	3			2	1	2	2	1		1	2	3	2												23	0	A.	
Colorado.....	72	T.	4	3	3	4	2		2	5	1		3	3	9	9	3	8	7	5	15	7	1		12	10	16	5	2	3	2	5	3	152	28	T.
Connecticut.....	31	A.							2				5	1						13	5					1							1	28	0	A.
Delaware.....	5	T.					1	1					3	1	1	2	3			1						2					1		16	0	T.	
Dist. of Columbia.....	4	A.										1					1			1	1									1			5	0	A.	
Florida.....	45	T.				2	1	1				4	1		1	1	2	1	5	2	2	1	3			6	3		1		2	4	43	0	T.	
Georgia.....	55	A.					8					6	1	5	2	6	2	1	7	1	1	6	7	8	3	7			1		10	2	84	0	A.	
Idaho.....	38	T.	1				3	2	1	1	4	2		1	1	5	5	7	5	2	1	1	3	2	1		5	8	6	4	3	1	74	0	T.	
Illinois.....	86	A.	8	4	3	4	3	2		1	7	13	6	4	11	11	8	4	32	33	27	24			9	1		29	7	27	2	4	284	0	A.	
Indiana.....	57	T.	4	1		2					2	9	4		2	12	6	2	6	15	6	16	4					3	1	9			104	0	T.	
Indian Territory.....	7	A.	3	1	1	2	1												1	2	3	1	1			1		2		2		23	0	A.		
Iowa.....	120	T.	2	3			1		1		8	2			4	2	2	30	23	14	20	23			6		10	17	2	9		18	198	0	T.	
Kansas.....	85	A.	12	2	4	4	2		2	1		5	1	10	12	16	2	10	9	12	15	5		4	8	9	18	6	1	4	3	18	195	0	A.	
Kentucky.....	48	T.			1	1	10	3			6	2	3	1	2	7	8		3	3	10	9	7	1		4		3	8	16	2		110	0	T.	
Louisiana.....	46	A.	1	3	2	1	2												3	1	4	9	6	4	9	2	5				1	6	59	0	A.	
Maine.....	18	T.											1				2				1												0	0	T.	
Maryland.....	40	A.				4	4	1	2			4	18	2	1	14	27		1	15	10	11	7	5	11	7	4		1	1	3		153	0	A.	
Massachusetts.....	59	T.											3	1				1		15	7											1	28	0	T.	
Michigan.....	104	A.	5	14						3	5	11						1		35	22	7	23	2					3			1	131	0	A.	
Minnesota.....	67	T.	2							1								19	11	1	11	10				5	12	6	1		6	84	0	T.		
Mississippi.....	43	A.	1	7		10	1			1										9		7	5	3	5	6					6	2	63	0	A.	
Missouri.....	95	T.	28	1	10	9	3	2		3	13	17	10	20	18	25	29	12	19	28	24	20					10	20	16	20		13	370	0	T.	
Montana.....	40	A.				3				1		9	4	3	3	2	1	3					5	1	2	1	1	3			3	1	46	0	A.	
Nebraska.....	144	T.	1		1			1	1	1	1	3	1	3	7	1		15	1	11	16	4	1	4	3	7	12	3	1		1	5	105	0	T.	
Nevada.....	50	A.		2	1		1					1	4	3	1	4	3	4	4	2				1			1	2					34	0	A.	
New Hampshire.....	21	T.										13								7													20	0	T.	
New Jersey.....	51	A.					2	14	3			31	10		7	24	1		20	24	3		2	14	10							165	0	A.		
New Mexico.....	34	T.			1				2	2	2	1																			1		9	0	T.	
New York.....	113	A.	2	6	3				2	2		1	19	20		1		2		39	3	4	10	10	9	5	1						141	0	A.	
North Carolina.....	57	T.				12	14	3			4	11	6	6	15	14	7	1	3	6	7	13	18	13	11	14	1	4	7	23	2	215	0	T.		
North Dakota.....	52	A.																						2	11						1	2	16	0	A.	
Ohio.....	134	T.	11		2	1				1	15	24	4	1	11	22	14	1	38	47	29	31	28	4	7			1	2	3	1	321	0	T.		
Oklahoma.....	21	A.	3	1	5	3		1			1			2	1	2	1	2	3				1		1		2	3	1		1	1	33	0	A.	
Oregon.....	72	T.							1	2	2	1	3	3	5	6									1	2	4	2	3	1	3	1	40	0	T.	
Pennsylvania.....	105	A.		1	3		1		3	1	1		3	16		1	10	23	1	7	36	26	10	3	16	18	12	3					195	0	A.	
Rhode Island.....	8	T.																	4	1													5	0	T.	
South Carolina.....	40	A.				1	12				1	5		3	3	4	4	4	4	3	1	6	2	4	6	12	4			5	14	1	99	0	A.	
South Dakota.....	56	T.										1	1	1	1			12	3	3	4	3			7	10	9	3	3	2	2	4	69	0	T.	
Tennessee.....	59	A.	1	3	3	3	11	8		3		14	5	6	7	5	4	5	2	4	7	14	10		7		1	13	10	8		154	0	A.		
Texas.....	59	T.	5	8	1	6	11	1		9	1									5	4	4	6		1			2		2	3	7	76	0	T.	
Utah.....	38	A.		3	3	2		2						1			2	1	4	1				4				1	1		1		26	0	A.	
Vermont.....	14	T.									2	7	1							3					1								14	0	T.	
Virginia.....	48	A.		1		2	19	12		1		2	12			18	13		2	7	4	9	12	3	8	7	14	1	8	9	12		176	0	A.	
Washington.....	50	T.													1	7	1	1			1						12						23	0	T.	
West Virginia.....	23	A.		1		1	3								8	7				3	2	3	10	1	1	2	2		5	1	3		53	0	A.	
Wisconsin.....	60	T.	4	9						2							1	22	1	5	16	2				1	7	4			2		76	0	T.	
Wyoming.....	17	A.									1	3	3	4	3	1	1		3	2				2	1			1	1	2	1		13	5	A.	
Sums.....	2,871	T.	102	96	59	59	115	84	37	27	24	76	150	212	105	118	212	237	151	207	425	304	281	158	123	160	178	149	137	125	142	122	110	4,545	0	T.
		A.	0	1	0	0	2	1	1	3	2	9	3	0	0	0	3	0	1	1	1	1	0	0	0	1	0	0	1	2	13	3	0	40	0	A.

TABLE IX.—Average hourly sunshine (in percentages), May, 1898.

Stations.	Instrument.	Percentages for each hour of local mean time ending with the respective hour.																Hours of sunshine.			
		A. M.								P. M.								Total.			
		5	6	7	8	9	10	11	Noon	1	2	3	4	5	6	7	8	Actual.	Possible.	Percent of possible.	Personal estimate.
Albany, N. Y.	T.	29	30	41	56	67	75	79	77	65	69	66	62	51	35	20	15	Hours.	Hours.	55	28
Atlanta, Ga.	T.	95	78	79	88	89	89	92	92	94	91	88	74	69	63	61	75	250.7	454.9	82	66
Atlantic City, N. J.	P.	41	39	38	38	42	46	44	35	49	54	49	51	46	40	42	42	355.1	432.6	82	66
Baltimore, Md.	T.	30	30	40	60	64	69	75	85	84	86	81	71	66	54	39	39	194.4	443.8	44	36
Binghamton, N. Y.	T.	19	23	28	35	41	53	60	66	63	64	53	52	34	23	20	18	283.4	443.8	64	36
Bismarck, N. Dak.	P.	44	49	55	65	66	65	60	56	53	57	63	59	53	41	36	32	193.5	451.9	43	31
Boston, Mass.	T.	25	31	41	45	47	53	49	56	59	62	52	49	36	27	22	6	253.8	467.4	54	56
Buffalo, N. Y.	T.	9	17	47	56	63	71	77	82	82	80	79	73	67	40	21	16	198.5	451.9	44	33
Charleston, S. C.	T.	53	57	64	67	75	80	82	92	82	82	85	71	71	61	59	100	267.7	454.9	59	29
Chattanooga, Tenn.	T.	74	61	60	71	83	89	84	81	77	75	71	69	67	42	42	62	318.4	430.7	74	66
Cheyenne, Wyo.	P.	40	39	47	53	51	53	49	46	49	47	44	39	35	34	22	19	302.1	434.2	70	57
Chicago, Ill.	T.	46	42	45	54	63	67	71	70	71	71	64	49	35	34	43	31	193.6	449.1	43	37
Cincinnati, Ohio	T.	54	49	53	51	61	73	80	83	85	81	79	75	62	55	67	307.2	443.8	69	57	
Cleveland, Ohio	T.	9	8	8	17	30	39	50	54	57	55	60	54	38	27	24	39	165.7	451.9	37	39
Columbia, Mo.	T.	45	46	45	59	68	75	79	78	78	76	72	74	64	52	43	44	286.3	443.8	65	41
Columbus, Ohio.	T.	46	42	49	59	74	82	88	86	88	87	85	80	69	64	47	58	317.1	446.7	71	45
Denver, Colo.	P.	68	60	57	59	56	56	55	56	46	50	53	49	41	39	38	33	328.8	446.7	51	35
Des Moines, Iowa.	T.	51	43	45	51	55	51	55	49	57	50	41	35	35	35	29	204.7	451.9	45	42	
Detroit, Mich.	T.	38	35	38	54	60	67	74	67	70	72	64	61	63	51	43	54	261.9	451.9	58	50
Dodge City, Kans.	P.	38	42	45	53	55	61	59	58	62	65	67	65	57	53	30	46	242.3	441.7	55	50
Dubuque, Iowa	T.	39	37	48	48	60	69	83	83	87	88	74	68	61	45	32	31	280.1	451.9	62	50
Eastport, Me.	P.	20	25	38	35	42	50	57	55	55	56	58	56	49	45	36	31	210.3	460.7	46	31
Erie, Pa.	T.	23	19	24	29	45	56	62	65	68	62	66	61	46	44	47	62	221.9	451.9	49	39
Eureka, Cal.	P.	14	18	25	40	42	46	53	58	63	66	60	54	49	50	44	40	210.3	449.1	47	36
Fresno, Cal.	T.	59	61	67	83	86	96	98	97	96	89	86	82	79	75	61	60	362.7	439.0	83	69
Galveston, Tex.	P.	.....	21	57	84	84	85	82	75	78	74	77	72	69	50	29	.....	287.5	421.8	68	54
Harrisburg, Pa.	T.	31	34	44	52	64	70	73	78	79	70	70	64	62	55	35	33	267.5	446.7	60	35
Helena, Mont.	P.	16	24	34	38	45	41	42	40	42	40	34	30	26	29	27	23	159.2	467.4	34	35
Huron, S. Dak.	T.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Idaho Falls, Idaho	T.	22	25	32	34	42	61	67	70	77	73	68	53	50	35	27	19	152.2	304.7	50	36
Indianapolis, Ind.	T.	41	39	40	51	59	67	71	77	74	69	60	54	49	44	39	42	250.8	446.7	56	42
Jacksonville, Fla.	T.	60	88	88	92	97	97	97	95	95	93	87	82	80	73	67	.....	374.3	423.7	88	66
Kansas City, Mo.	P.	29	32	39	49	47	49	54	48	41	47	49	40	33	25	23	33	181.5	443.8	41	39
Key West, Fla.	T.	.....	38	46	65	79	83	83	88	93	91	87	85	77	60	59	.....	310.4	414.6	75	74
Knoxville, Tenn.	T.	50	51	56	68	82	90	94	95	92	90	91	87	84	72	63	79	349.1	436.7	80	76
Little Rock, Ark.	T.	74	67	67	70	71	70	80	78	78	74	69	67	60	64	64	75	304.1	434.2	70	51
Los Angeles, Cal.	P.	45	42	43	46	55	59	64	71	68	75	76	80	77	75	70	86	278.4	432.6	64	53
Louisville, Ky.	T.	67	58	58	60	65	64	64	72	77	73	73	65	61	61	64	71	289.2	441.7	65	51
Minneapolis, Minn.	T.	23	23	28	47	51	58	66	68	63	66	57	50	45	31	19	21	214.5	460.7	47	.....
Nashville, Tenn.	T.	83	69	71	82	91	94	97	95	91	93	93	86	81	74	64	71	368.0	436.7	84	66
New Orleans, La.	T.	60	65	69	78	86	89	85	88	84	77	72	69	60	57	52	.....	313.8	423.7	74	71
New York, N. Y.	T.	15	17	30	40	42	45	53	56	57	59	57	50	43	33	17	5	187.0	449.1	42	32
Northfield, Vt.	P.	23	29	38	44	50	46	41	41	42	37	39	37	38	37	13	6	168.9	457.9	37	27
Oklahoma, Okla.	T.	67	49	50	64	73	79	79	78	83	84	83	82	76	63	58	75	311.6	434.2	72	66
Omaha, Nebr.	P.	47	42	48	54	54	53	53	51	52	43	45	44	42	42	36	38	210.9	449.1	47	37
Parkersburg, W. Va.	T.	26	29	30	38	56	64	60	58	61	65	66	59	53	36	34	39	222.5	443.8	50	45
Philadelphia, Pa.	T.	40	39	42	40	42	49	56	58	67	63	57	52	45	39	33	23	215.5	446.7	48	30
Phoenix, Ariz.	P.	80	74	81	90	94	93	96	97	95	96	93	94	91	85	78	100	387.0	430.7	90	84
Pittsburg, Pa.	T.	36	32	33	37	51	64	73	76	67	64	67	63	52	45	32	34	239.7	449.1	53	34
Portland, Me.	T.	7	22	39	51	66	71	74	75	72	76	68	59	49	36	17	5	241.7	457.9	53	34
Portland, Oreg.	T.	23	31	47	57	63	65	68	72	71	66	58	63	58	47	44	36	259.0	464.1	56	54
Raleigh, N. C.	T.	17	19	22	51	66	84	95	90	90	88	87	85	72	60	37	43	294.4	436.7	67	52
Rochester, N. Y.	T.	30	31	34	42	50	47	52	62	61	60	59	45	42	26	16	16	199.0	454.9	44	41
St. Louis, Mo.	T.	25	20	34	51	71	81	79	81	85	88	84	76	70	63	47	67	292.2	443.8	66	44
St. Paul, Minn.	P.	30	31	39	46	50	54	59	55	58	55	53	52	47	39	34	.....	224.4	460.7	49	45
Salt Lake City, Utah.	P.	29	31	36	47	56	52	50	53	50	57	63	56	55	46	35	33	218.1	449.1	49	34
San Diego, Cal.	P.	33	29	31	35	44	56	66	73	77	83	82	76	72	63	57	80	259.2	430.7	60	70
San Francisco, Cal.	T.	16	10	27	42	62	73	83	85	85	80	79	75	67	46	27	29	262.9	441.7	60	41
Santa Fe, N. Mex.	T.	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Savannah, Ga.	P.	88	82	89	95	93	91	93	91	88	88	87	82	73	63	57	100	360.2	428.4	84	73
Seattle, Wash.	T.	38	42	47	57	59	66	74	78	72	77	65	66	56	34	28	22	266.5	471.1	57	55
Spokane, Wash.	T.	48	57	62	71	80	80	86	84	86	89	92	84	81	63	47	34	345.0	471.3	73	53
Tacoma, Wash.	T.	51	46	40	49	58	65	76	75	77	70	65	58	46	29	23	.....	270.4	467.4	58	55
Tampa, Fla.	T.	.....	94	94	81	80	82	83	84	89	88	85	86	84	92	94	.....	363.8	419.8	87	85
Vicksburg, Miss.	T.	50	39	39	48	75	90	85	91	88	85	83	76	7							

* No record.

† All values, except the personal estimate, for 21 days.

TABLE X.—Accumulated amounts of precipitation for each 5 minutes, for storms in which the rate of fall equaled or exceeded 0.25 in any 5 minutes, or 0.75 in 1 hour during May, 1898, at all stations furnished with self-registering gauges.

Stations.	Date.	Total duration.		Total amt of precipi- tation.	Excessive rate.		Amount be- fore exces- sive began.	Depths of precipitation (in inches) during periods of time as indicated.															
		From—	To—		Began—	Ended—		5 min.	10 min.	15 min.	20 min.	25 min.	30 min.	35 min.	40 min.	45 min.	50 min.	60 min.	80 min.	100 min.	120 min.		
Albany, N. Y.	26-27	1	2	3	4	5	6	7															
Atlanta, Ga.	23	4.45 p. m.	6.20 p. m.	1.25	0.68	5.42 p. m.	6.10 p. m.	0.01	0.16	0.31	0.46	0.53	0.62	0.67					0.20				
Atlantic City, N. J.	12-13			1.01															0.40				
Baltimore, Md.	16			1.00													0.87						
Binghamton, N. Y.	19			0.54															0.53				
Bismarck, N. Dak.	17-18			1.37															0.18				
Boston, Mass.	24-25			1.74															0.31				
Buffalo, N. Y.	12			0.49															0.15				
Calro, Ill.	4	D. N.	8.30 a. m.	1.12	0.35	7.20 a. m.	7.35 a. m.	0.64	0.27	0.42	0.45												
Charleston, S. C.	26																		0.34				
Chicago, Ill. *	11			0.62															0.35				
Cincinnati, Ohio	15-16			0.39															0.11				
Cleveland, Ohio	15	6.10 p. m.	11.00 p. m.	1.47		8.00 p. m.	8.25 p. m.	0.33	0.17	0.31	0.46	0.63	0.75										
Columbia, Mo.	11-12			1.20				0.02											0.30				
Columbus, Ohio	27	5.55 p. m.	9.11 p. m.	1.25		8.38 p. m.	9.10 p. m.	0.03	0.03	0.05	0.08	0.60	1.02	1.30	1.24								
Denver, Colo.	31	8.40 a. m.	9.36 a. m.	0.56		8.50 a. m.	9.10 a. m.	0.01	0.12	0.30	0.48	0.53											
Des Moines, Iowa	20			0.48															0.30				
Detroit, Mich.	13-14	11.40 p. m.	2.20 a. m.	1.51		12.17 a. m.	1.00 a. m.	T.	0.06	0.15	0.30	0.58	0.68	0.75	0.85	1.15	1.25						
Dodge City, Kans.	25	9.38 a. m.	1.25 p. m.	2.48		9.38 a. m.	11.38 a. m.	0.00	0.10	0.17	0.32	0.45	0.52	0.60	0.80	0.98	1.20	1.35	1.56	2.00	2.30	2.45	
Do.	31			1.06															0.40				
Duluth, Minn.	27-28			1.26															0.08				
Eastport, Me.	11-12			0.47															0.13				
Erie, Pa.	14-15			0.68															0.19				
Fresno, Cal.	31	1.21 p. m.	3.17 p. m.	1.22		1.35 p. m.	2.13 p. m.	0.01	0.22	0.43	0.60	0.67	0.83	1.04	1.13	1.21							
Galveston, Tex.	†	9.50 p. m.	3.45 a. m.	1.17		12.32 a. m.	12.56 a. m.	0.11	0.32	0.52	0.57	0.61	0.66										
Hannibal, Mo.	7-8			1.56															0.23				
Harrisburg, Pa.	30			0.74															0.53				
Hatteras, N. C.	20			0.79															0.50				
Huron, S. Dak.	17			0.25															0.18				
Idaho Falls, Idaho	19			0.57															0.46				
Indianapolis, Ind.	25	4.50 p. m.	5.20 p. m.	0.90		4.52 p. m.	5.05 p. m.	T.	0.40	0.62	0.85	0.90											
Jacksonville, Fla.	11			0.60															0.26				
Jupiter, Fla.	1	D. N.	D. N.	1.72		12.22 a. m.	1.15 a. m.	0.01	0.06	0.15	0.31	0.53	0.73	0.82	0.92	1.07	1.27	1.40	1.50	1.67			
Kansas City, Mo.	11-12	9.05 p. m.	D. N.	2.58		*11.17 p. m.	*11.37 p. m.	0.35	0.70	1.05	1.40												
Key West, Fla.	22			0.43															0.35				
Knoxville, Tenn.	26-27	9.20 p. m.	D. N.	1.24		9.45 p. m.	10.35 p. m.	0.05	0.05	0.15	0.30	0.60	0.65	0.68	0.71	0.75	0.80	0.85					
Lincoln, Nebr.	21	2.53 p. m.	8.02 p. m.	1.80		6.50 p. m.	7.25 p. m.	0.07	0.22	0.57	0.97	1.24	1.40	1.53	1.67	1.71							
Little Rock, Ark.	15			1.46															0.45				
Los Angeles, Cal.	6-7			1.73															0.28				
Louisville, Ky.	19-20			1.83															0.80				
Louisville, Ky.	21			0.21															0.15				
Memphis, Tenn.	6			0.21															0.30				
Milwaukee, Wis.	26-27			1.12															0.32				
Montgomery, Ala.	5-6			0.80																			
Nantucket, Mass.	2			0.01																			
Nashville, Tenn.	7-8			1.52															0.26				
New Orleans, La.	15	1.10 p. m.	2.10 p. m.	0.74		1.15 p. m.	1.40 p. m.	T.	0.16	0.37	0.54	0.64	0.71										
New York, N. Y.	12			0.70															0.25				
Norfolk, Va.																			0.68	0.85	1.01	1.00	
Northfield, Vt.	3-4	12.45 p. m.	4.30 p. m.	5.13		1.05 p. m.	3.00 p. m.	0.04	0.07	0.09	0.14	0.19	0.27	0.30	0.41	0.44	0.47	0.50	0.68	0.85	1.01	1.00	
Oklahoma, Okla.						8.05 p. m.	8.45 p. m.	1.55	0.10	0.25	0.45	0.56	0.57	0.58	0.69	0.77							
Omaha, Nebr.	14	D. N.	D. N.	0.49		12.50 a. m.	1.35 a. m.	2.49	0.05	0.23	0.27	0.34	0.39	0.53	0.65	0.74	0.78	0.80	0.83				
Do.	19	7.17 p. m.	9.03 p. m.	0.76		2.24 a. m.	2.49 a. m.	T.	0.13	0.22	0.37	0.45	0.49										
Parkersburg, W. Va.	15			0.46		7.29 p. m.	8.29 p. m.	T.	0.05	0.23	0.38	0.53	0.58	0.63	0.68	0.70	0.73	0.74	0.76				
Philadelphia, Pa.	12	4.33 p. m.	6.15 p. m.	0.67		4.34 p. m.	4.45 p. m.	0.01	0.32	0.50	0.57	0.58	0.59	0.60	0.61								
Pittsburg, Pa.	15-16			0.79															0.38				
Portland, Me.	27-28			1.03															0.17				
Portland, Oreg.	14-15			0.52															0.16				
Raleigh, N. C.	15-16	9.25 p. m.	12.25 a. m.	3.21		11.10 p. m.	11.45 p. m.	0.04	0.13	0.43	0.88	1.33	1.78	1.98	2.18	2.22							
Richmond	6-7			0.75															0.54				
Rochester, N. Y.	21			0.45				0.35															
St. Louis, Mo.	1	3.55 p. m.	5.45 p. m.	1.34		4.01 p. m.	4.30 p. m.	T.	0.27	0.43	0.48	1.22	1.23	1.24									
Do.	21	1.42 a. m.	5.41 a. m.	1.71		1.51 a. m.	2.40 a. m.	0.01	0.13	0.18	0.18	0.37	0.55	0.88	1.08	1.16	1.18	1.20	1.22	1.27	1.46	1.56	
Do.	27	4.05 p. m.	5.40 p. m.	0.53		5.15 p. m.	5.25 p. m.	0.06	0.36	0.47													
St. Paul, Minn.	20-21			1.56															0.48				
Salt Lake City, Utah.	18-19			0.89															0.20				
San Diego, Cal.	1			0.10																			
San Francisco, Cal.	14-15			1.23															0.15				
Savannah, Ga.	30			0.81															0.80				
Seattle, Wash.	20-21			0.40															0.07				
Spokane, Wash.	26-27			0.64															0.20				
Tampa, Fla.	11			0.26															0.10				
Vicksburg, Miss.	5			0.57															0.43				
Washington, D. C.	16	5.50 p. m.	6.35 p. m.	0.69		5.55 p. m.	6.17 p. m.	T.	0.07	0.36	0.61	0.66											
Wilmington, N. C.	13	5.13 p. m.	6.50 p. m.	0.92		5.26 p. m.	5.46 p. m.	0.01	0.11	0.35	0.57	0.73											
Do.	24	4.13 p. m.	4.50 p. m.	1.01		4.17 p. m.	4.36 p. m.	0.01	0.12	0.34	0.73	0.95	0.99	1.01									
Yankton, S. Dak. *																							

* Record incomplete.

† May 31-June 1.

TABLE XI.—Excessive precipitation, by stations, for May, 1898.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>Arkansas.</i>						
Conway.....	<i>Inches.</i>	<i>Inches.</i>		<i>Ins.</i>	<i>h.m.</i>	
Do.....		3.70	1-2			
Dallas.....	14.28	2.95	21			
Fayetteville.....	10.42	6.31	1-2			
Fort Smith.....		2.95	4			
Helena (a).....		2.78	20-21			
Hot Springs.....		3.07	19-20			
Do.....		3.05	1-2			
Keesees Ferry.....		3.50	20-21			
Little Rock.....		2.71	3-4			
Lonoke.....		3.17	21	1.76	1 00	21
Mana.....	13.89	3.00	1-2			
Moore.....		3.00	21	2.00	0 40	1
Do.....		3.00	1			
Mossville.....	11.33	3.00	21			
Pond.....	11.68	6.47	4-5			
Spilerville.....	11.05					
Stuttgart.....		2.54	24			
Witts Springs.....	10.61	2.82	19			
		5.51	4-5			
<i>California.</i>						
Fort Ross.....		3.43	15			
Mount Tamalpais.....		2.65	15			
<i>Colorado.</i>						
Denver.....				1.24	0 35	27
<i>Connecticut.</i>						
Middletown.....		2.87	26-27			
<i>Florida.</i>						
Key West.....		2.58	11-12	1.50	1 00	11
St. Andrews.....				1.50	1 00	25
St. Francis Barracks.....		2.85	25-26			
<i>Georgia.</i>						
Elberton.....		3.45	18	3.45	1 00	18
Waynesboro.....				2.05	1 10	18
<i>Idaho.</i>						
Albany Falls.....		2.60	27			
<i>Illinois.</i>						
Bloomington.....				1.13	1 00	30
Cambridge.....				1.10	1 00	20
Carlyle.....		4.14	29			
Halliday.....		3.58	20			
Laharpe.....		3.60	19			
Morrisonville.....		3.96	19-20			
<i>Indiana.</i>						
Crawfordsville.....	10.57	3.05	18			
Kokomo.....		2.89	19			
Lafayette.....		2.62	19			
Marion.....		3.29	19			
<i>Indian Territory.</i>						
Purcell.....		5.70	3-4	1.49	0 45	20
South McAlester.....	10.23	4.62	3-4			
Do.....		3.87	19-20			
Tablequah.....	11.46	3.62	4			
Tulsa.....		3.70	4			
Wagoner.....	12.16	6.18	3-4			
Do.....		3.30	19-20			
<i>Iowa.</i>						
Cedarfalls.....		2.60	30	2.00	1 00	31
Clearlake.....		3.73	21			
Fort Madison.....		2.97	19			
Keokuk.....		3.10	18-19			
Keosauqua.....		2.68	19			
Mason City.....		2.50	22			
Mountayr.....		2.82	20	2.82	1 40	20
<i>Kansas.</i>						
Anthony.....	10.33	2.70	1			
Do.....		2.90	18			
Atchison.....	10.32					
Augusta.....		3.50	1	1.23	1 00	31
Burlington.....		2.73	1			
Chanute.....		2.89	16			
Cunningham.....		3.10	26			
Dodge City.....	10.31	5.32	25-26	1.25	0 43	14
Do.....				1.65	1 00	25
Eureka.....		3.42	1			
Fanning.....				1.80	0 45	31
Fort Scott.....		2.65	12			
Garfield.....		3.01	24-25			
Gove.....		2.61	25			
Hays.....	10.42			2.00	1 20	26
Independence.....		2.71	3-4			
Lebo.....		2.60	1			
Macksville.....				1.10	0 30	1
Morantown.....		3.27	15			
Ness City.....				1.56	0 50	25
Norwich.....				1.20	0 30	26
Olathe.....	11.88	2.90	14			
Ottawa.....	11.86	4.06	14-15			
Pratt.....	11.20	5.30	25-26			
Rome.....				1.22	0 18	15
Do.....				1.12	1 00	25
Do.....				1.54	0 40	31
Ulysses.....		4.04	25			
Wichita.....		2.88	31	2.25	1 50	31
Yates Center.....		2.88	1			
<i>Kentucky.</i>						
Carrollton.....		2.88	6			
Ensor.....		2.55	6			
Lexington.....		2.61	6-7			
<i>Louisiana.</i>						
Grand Coteau.....				1.05	0 45	31

TABLE XI.—Excessive precipitation—Continued.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>Maryland.</i>						
Bachmans Valley	<i>Inches.</i> 12.29	<i>Inches.</i> 4.40	7-8	<i>Ins.</i>	<i>h.m.</i>	
<i>Michigan.</i>						
Baraga		4.11	27-28			
Hanover		2.62	20-21			
<i>Minnesota.</i>						
Bingham Lake		2.60	20-21			
Caledonia				1.80	1 30	27
Lake Jennie		3.25	26-27			
Mapleplain		2.80	26-27			
Minneapolis		2.70	21			
<i>Mississippi.</i>						
Austin		2.60	20			
Burke				1.00	1 00	22
<i>Missouri.</i>						
Arlington		3.40	20			
Bethany		2.80	18			
Birchtree		2.56	4			
Brunswick	11.88	3.17	19-20			
Carrollton		2.65	*			
Darksville	10.60					
Fairport		2.65	31			
Farmersville	10.15	2.92	31			
Gallatin	10.14	3.00	31			
Gordonville		3.04	26			
Houstonia		2.50	15-16			
Kansas City		2.63	*	1.50	1 00	1
Kidder	11.17	2.64	11	2.56	0 27	11
Lamonte	11.28	3.12	15			
Lexington		2.98	1			
Marblehill		2.57	28			
Marshall		2.50	14			
Mineralspring	12.43	4.53	20-21			
Mount Vernon	10.70	3.04	1			
Do		3.00	4			
Neosho	10.43	2.93	1			
Do		3.39	3-4			
Oakmound		2.94	3-4			
Olden		2.87	3-4			
Pickering		2.56	26-27			
Princeton		2.95	18-19			
St. Charles		3.05	29			
St. Louis				1.29	1 00	1
Do				1.21	1 00	21
Sarcozie		2.62	1			
Seymour		2.72	20-21			
Shelbina	10.40	2.50	13-14			
Sublett	19.22	5.50	19			
<i>Nebraska.</i>						
Brokenbow				1.08	0 45	16
Imperial		3.00	15			
Nesbit		2.55	16-17			
Republican				2.10	0 45	26
Seneca				1.20	1 10	28
Tablerock		2.52	17			
Wallace		3.00	17			
<i>New Jersey.</i>						
Plainfield		2.75	7-8			
<i>New York.</i>						
Setauket		3.00	26			
<i>North Carolina.</i>						
Edenton	10.03	2.80	6			
Do		2.80	26			
Greensboro		2.52	22-23			
Raleigh		3.21	15-16	2.25	1 00	16
Wilmington				1.01	0 37	24
<i>North Dakota.</i>						
Wildrice		2.54	25			
<i>Oklahoma.</i>						
Anadarko	10.13	7.60	3-4			
Arapaho		2.78	3			
Burnett	12.45	8.50	3-4			
Clifton	10.64	2.70	1			
Do		6.97	3-4			
Fort Reno		3.38	2-3			
Guthrie		2.50	3-4			
Hennessey		2.50	1			
Jefferson		3.00	1			
Kingfisher		5.25	2-3			
Norman	11.74	9.21	3-4			
Oklahoma		6.76	2-4			
Sac and Fox Agency	10.18	7.25	3-4			
Stillwater		3.45	2-3			
Winnview	13.38	5.00	*			
Do		3.05	2-3			
<i>Pennsylvania.</i>						
Cassandra		2.65	15-16			
Hamburg		3.92	7-8			
Lebanon				1.02	0 35	11
Westtown				1.29	1 00	25
<i>Rhode Island.</i>						
Narragansett Pier		2.65	8-9			
<i>South Carolina.</i>						
Batesburg				1.25	1 10	21
Smiths Mills				2.18	1 30	14
Do				1.25	1 00	19
Do		4.06	24-25	3.97	3 00	25
<i>South Dakota.</i>						
Chamberlain		3.12	26-27	2.33	1 15	26
Flandreau		2.64	17			
Do		3.00	20			

TABLE XI.—*Excessive precipitation*—Continued.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>South Dakota—Continued.</i>						
Forestburg	<i>Inches.</i>	<i>Inches.</i>		<i>Ins.</i>	<i>A. m.</i>	
Hotch City		4.45	17	1.05	00	20
Menno		2.85	17			
Do		2.59	20			
Parker		3.37	20-21			
Sioux Falls		4.05	20-21			
Tyndall		3.20	17			
Wentworth		2.59	17			
Wolsey		2.50	17			
<i>Tennessee.</i>						
Arlington		2.60	21			
Johnsonville		3.38	21-22			
<i>Texas.</i>						
Arthur City		3.16	20-21			
Beeville		2.65	9-10			
Boerne				1.30	0 45	5
Brownwood		3.70	2	3.70	1 15	2
Do				1.05	0 50	5
Coleman		5.00	9-10			
Emory				1.45	1 00	5

TABLE XI.—*Excessive precipitation*—Continued.

Stations.	Monthly rainfall 10 inches, or more.	Rainfall 2.50 inches, or more, in 24 hours.		Rainfall of 1 inch, or more, in one hour.		
		Amt.	Day.	Amt.	Time.	Day.
<i>Texas—Continued.</i>						
Forestburg	<i>Inches.</i>	<i>Inches.</i>		<i>Ins.</i>	<i>A.m.</i>	
Gainesville		3.00	21	3.00	3 00	21
Galveston		2.75	20-21			
Henrietta		2.50	19-20	1.32	0 38	31
Honeygrove		2.86	19-20			
Huntsville		4.95	22-23			
Jasper		2.75	22			
Mount Blanco				1.04	0 30	3
New Braunfels				1.12	1 00	9
Do.....				1.46	1 00	22
Runge.....				1.25	1 00	5
San Marcos		4.21	22			
<i>Virginia.</i>						
Blacksburg		2.51	6			
Charlottesville		2.50	22			
Lynchburg		3.54	5-6			
<i>Wisconsin.</i>						
Osceola		2.05	26-27			
Watertown		2.64	17-18	1.80	1 30	18

* April 30-May 1.

Chart I. Tracks of Centers of High Areas. May, 1898.

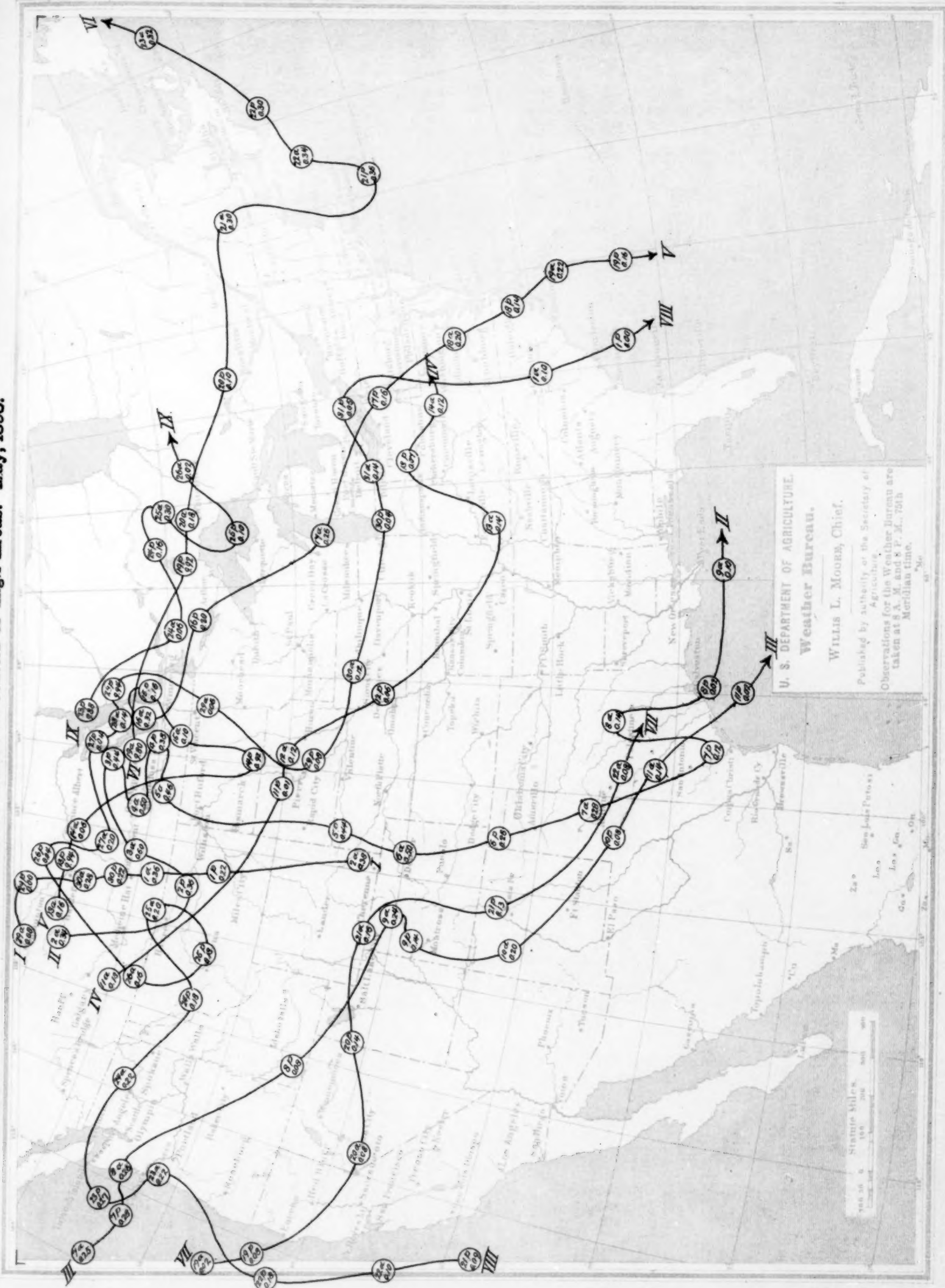


Chart II. Tracks of Centers of Low Areas. May, 1898.

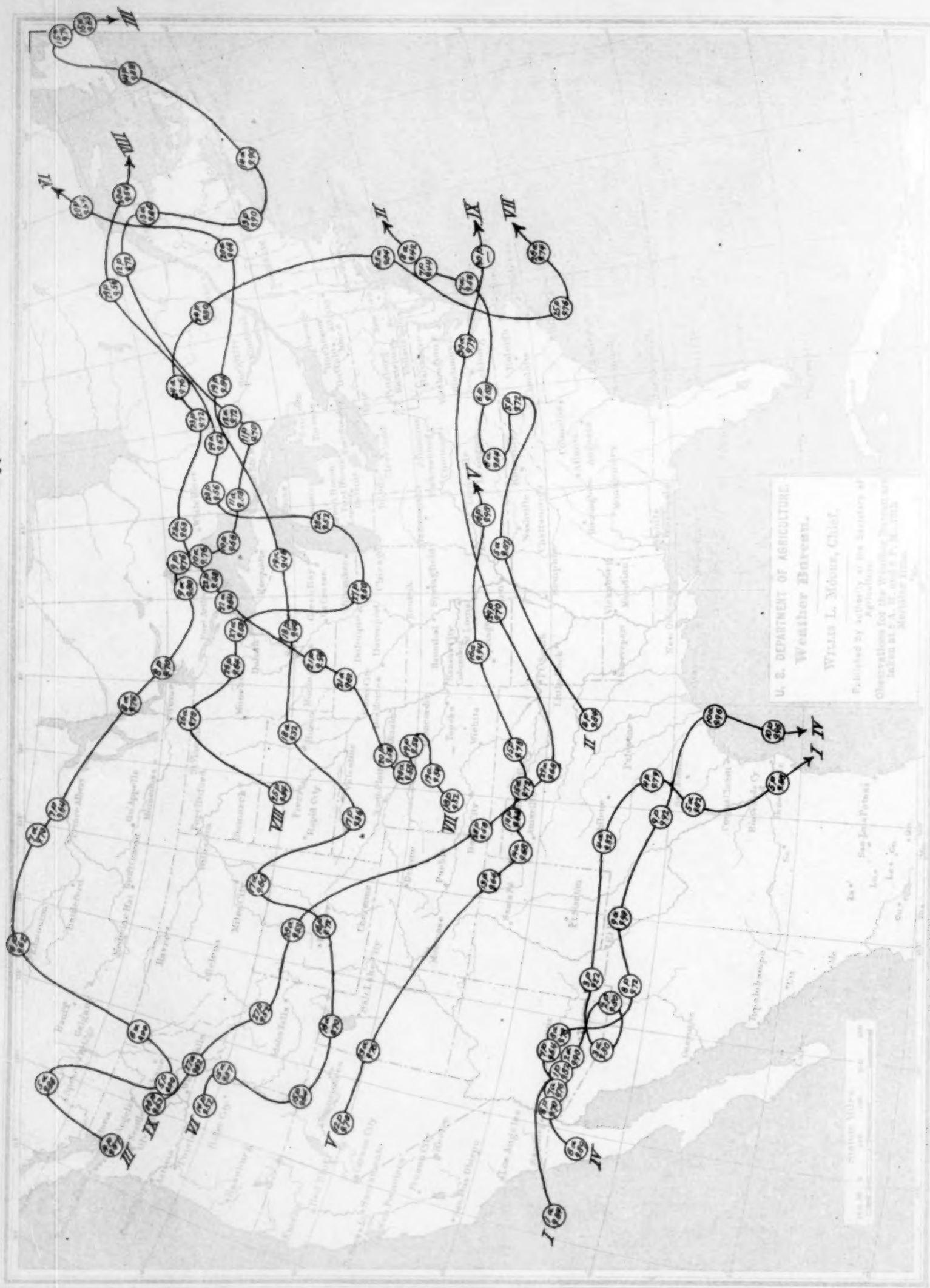


Chart III. Total Precipitation. May, 1898.

Chart III. Total Precipitation. May, 1898.

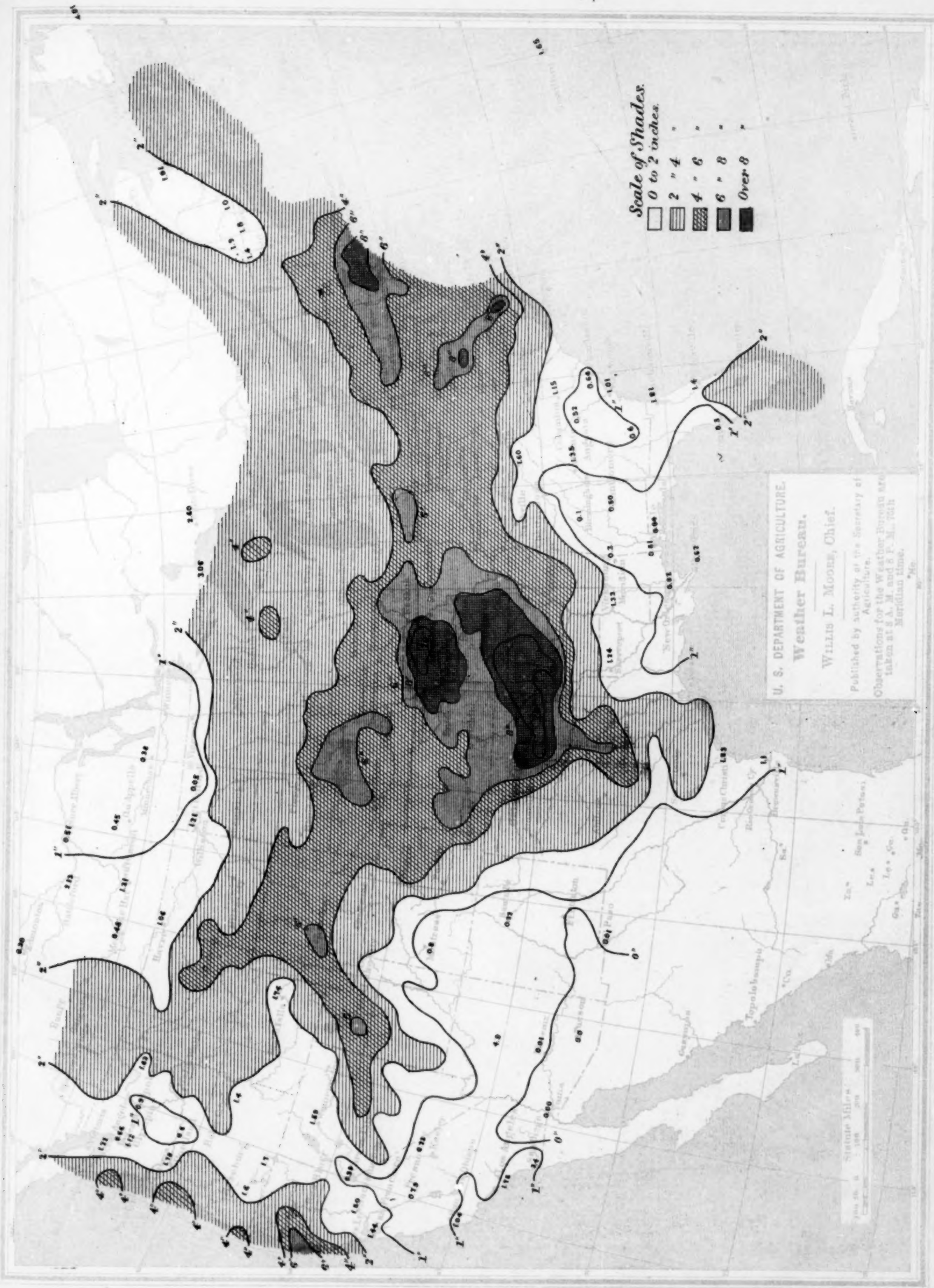
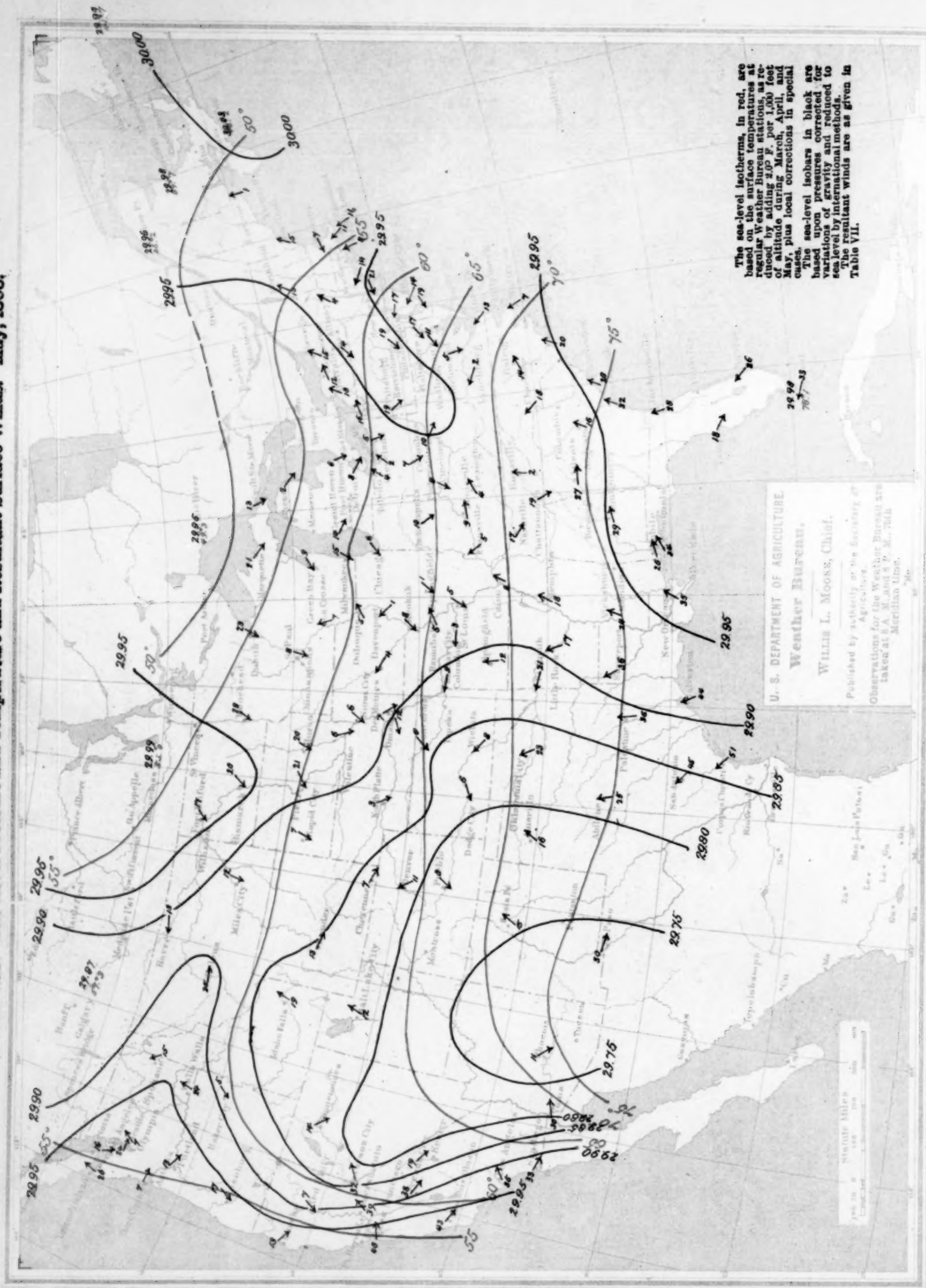


Chart IV. Sea-Level Pressure and Temperature and Resultant Surface Winds. May, 1898.



The sea-level isotherms, in red, are based on the surface temperatures at regular Weather Bureau stations, as reduced by adding 2.0° F. per 1,000 feet of altitude during March, April, and May, plus local corrections in special cases.

The sea-level isobars in black are based upon pressures corrected for variations of gravity and reduced to sea level by international methods.

The resultant winds are as given in Table VII.

U. S. DEPARTMENT OF AGRICULTURE

Weather Bureau.

WILLIS L. MOORE, Chief.

Published by authority of the Secretary of Agriculture.

Observations for the Weather Bureau are taken at 8 A. M. and 8 P. M., with morning time.

Chart V. Hydrographs for Seven Principal Rivers of the United States. May, 1898.

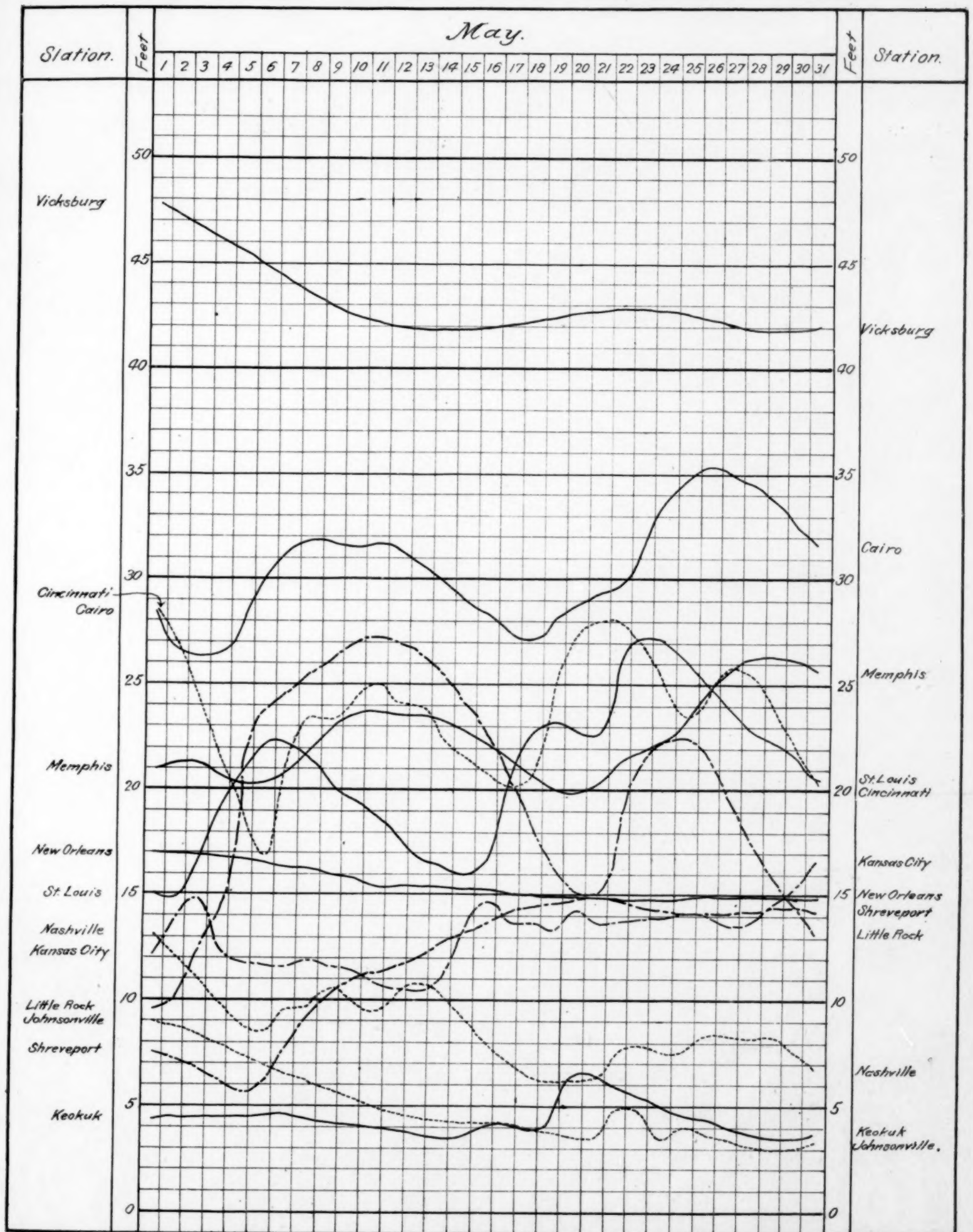


Chart VI. Surface Temperatures; Maximum, Minimum, and Mean. May, 1898.

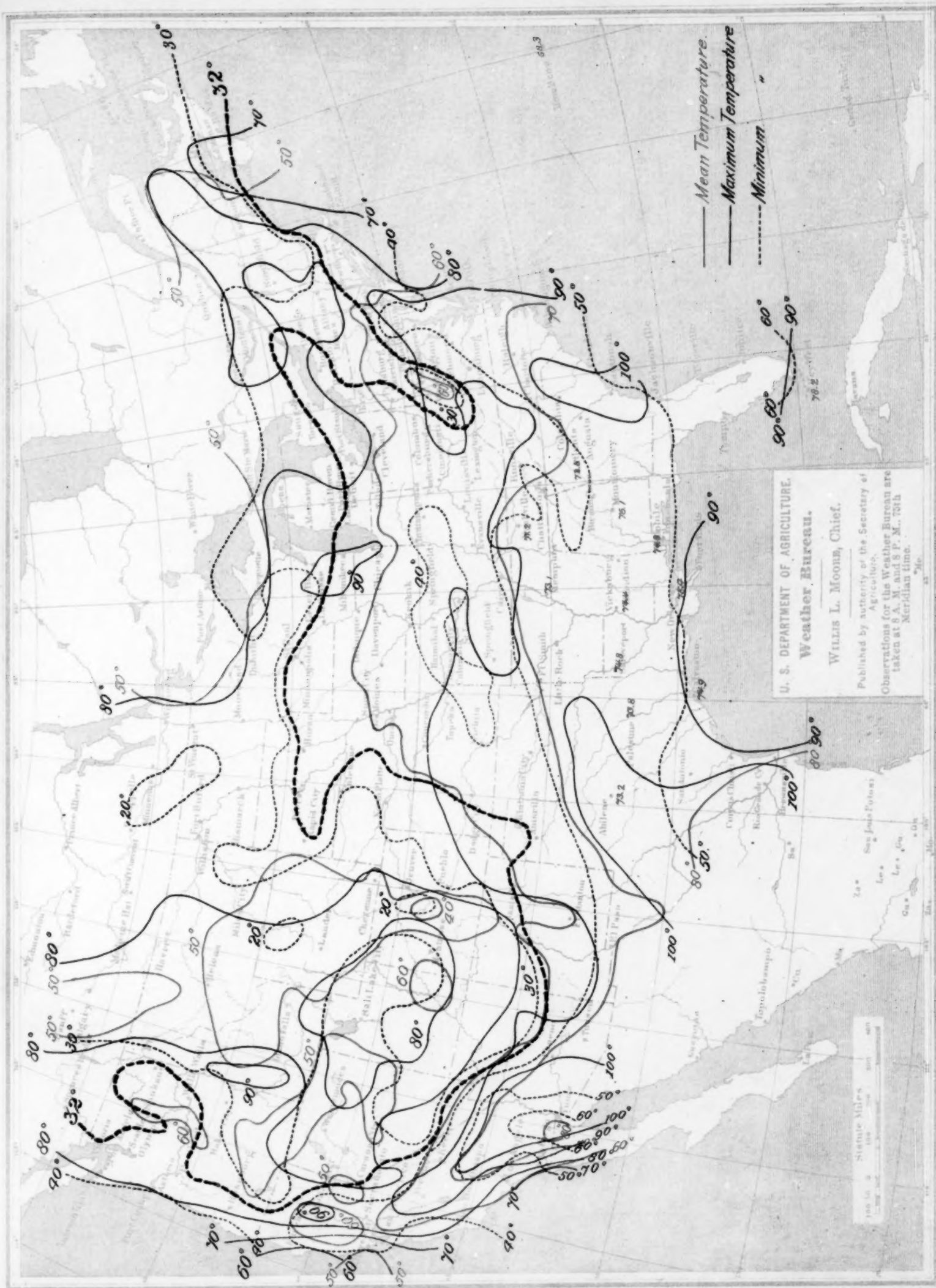


Chart VII. Percentage of Sunshine. May, 1898.

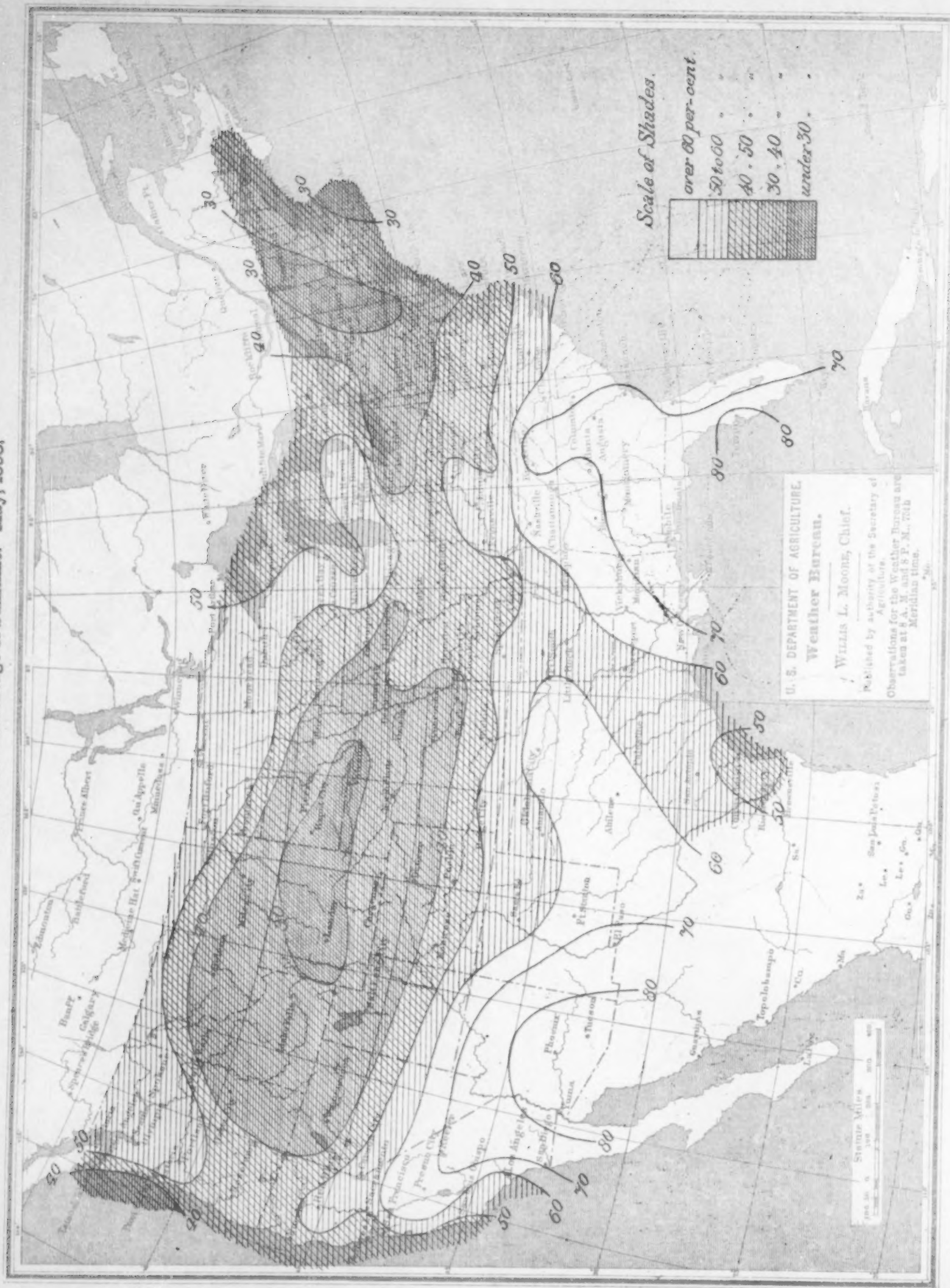


Chart VIII. Total Snowfall. May, 1898.

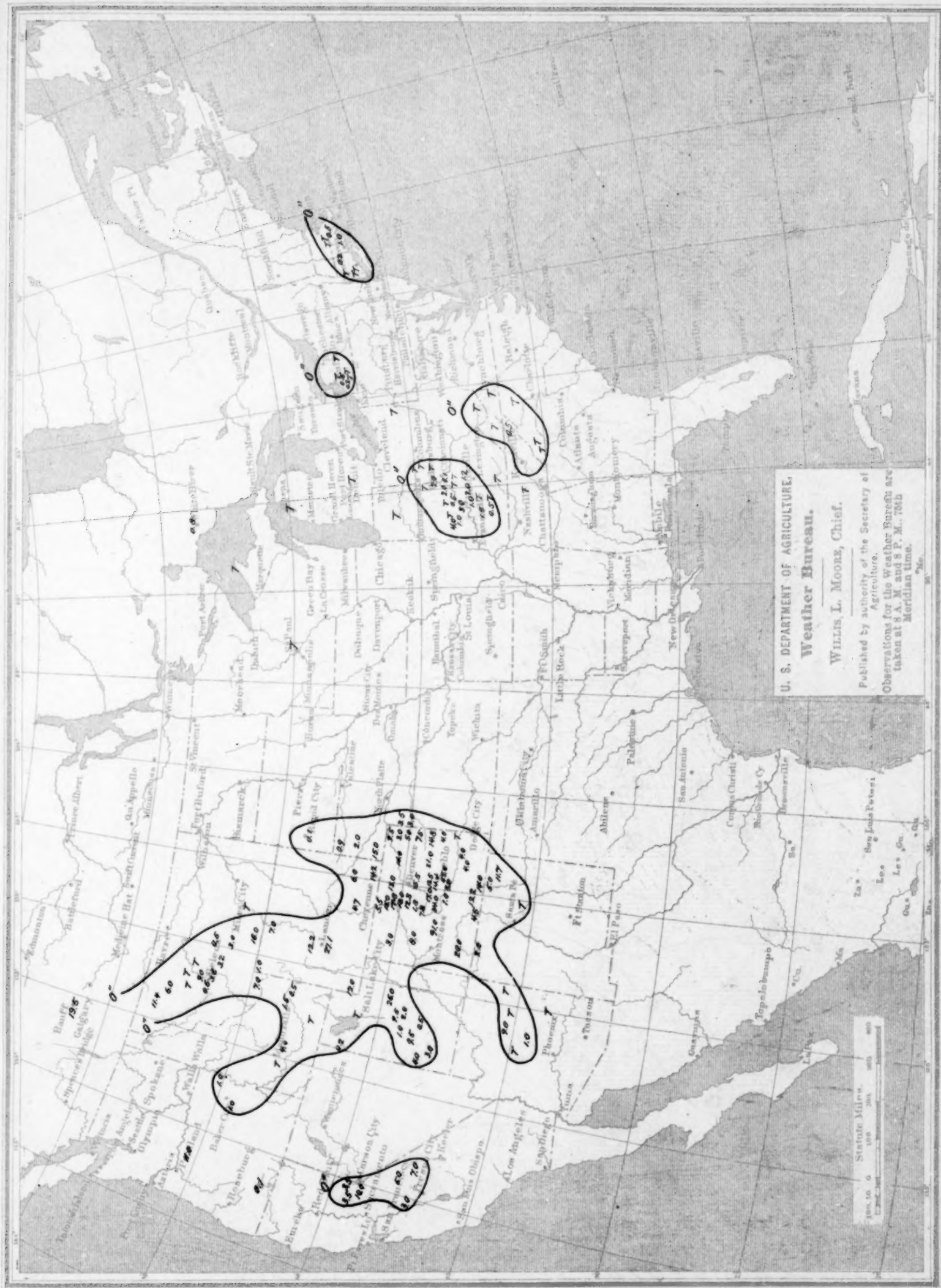


Chart IX. Tornadoes on the Afternoon of May 17, 1898.

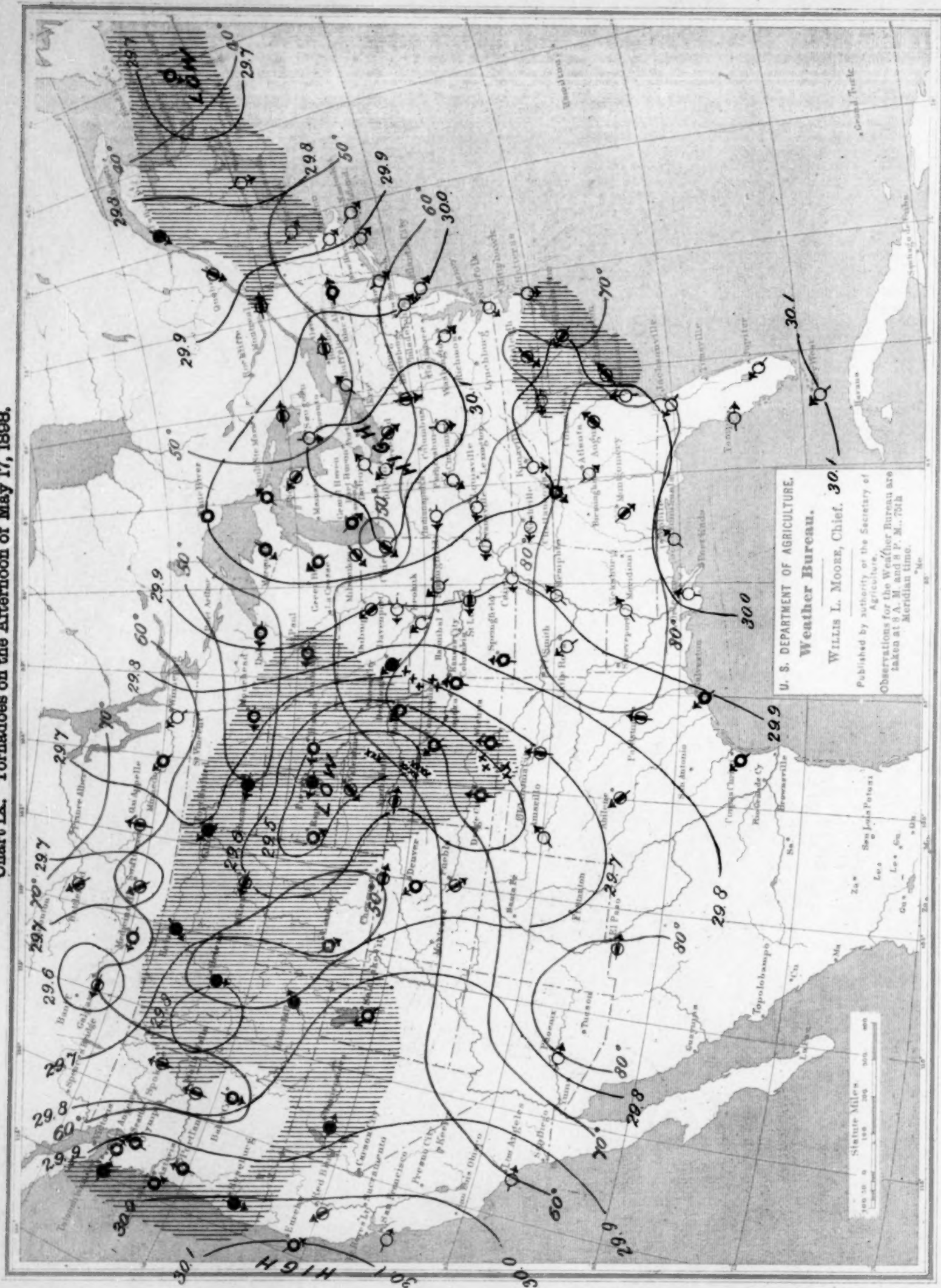


Chart X. Tornadoes on the Afternoon of May 18, 1898.

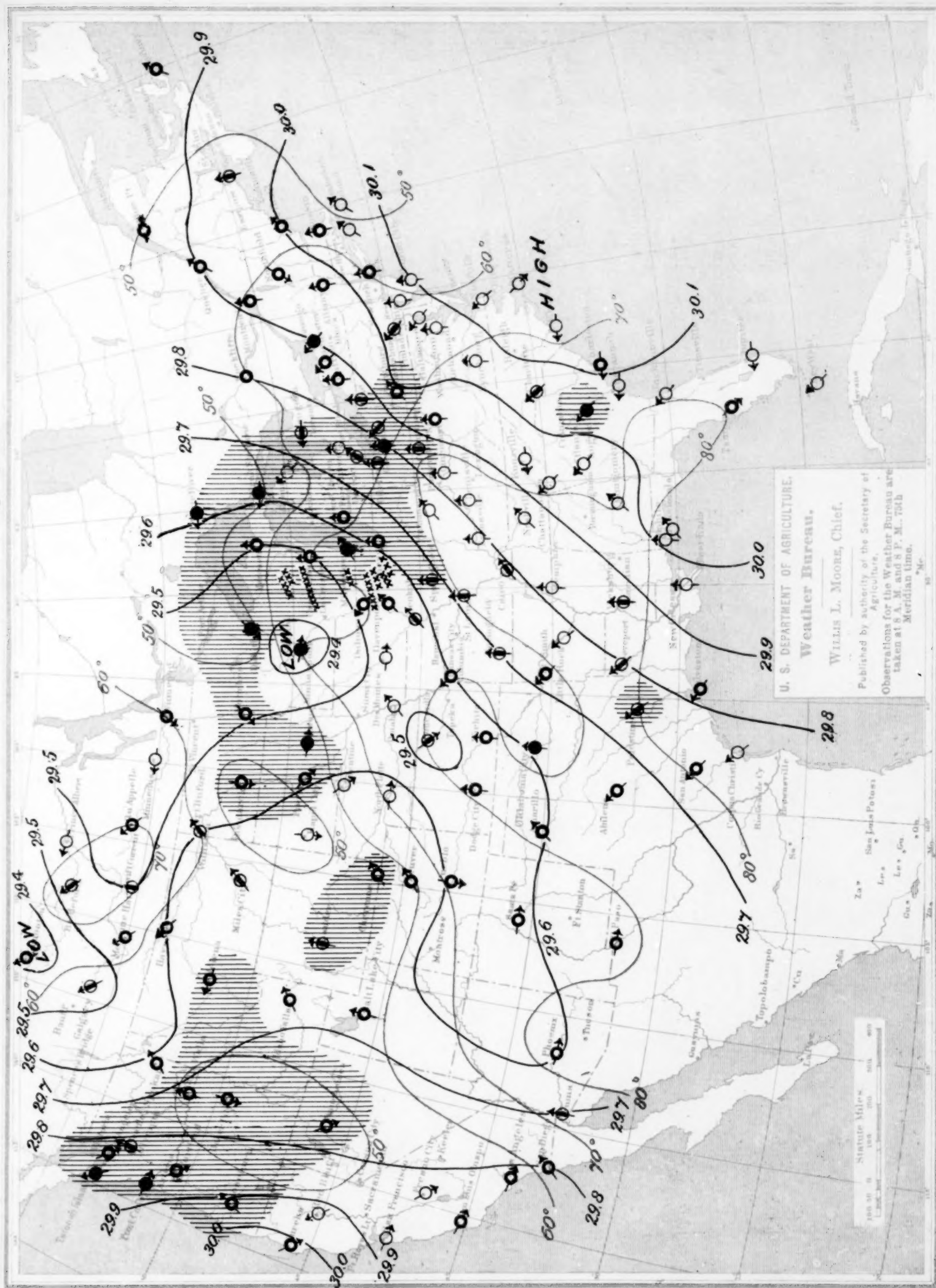
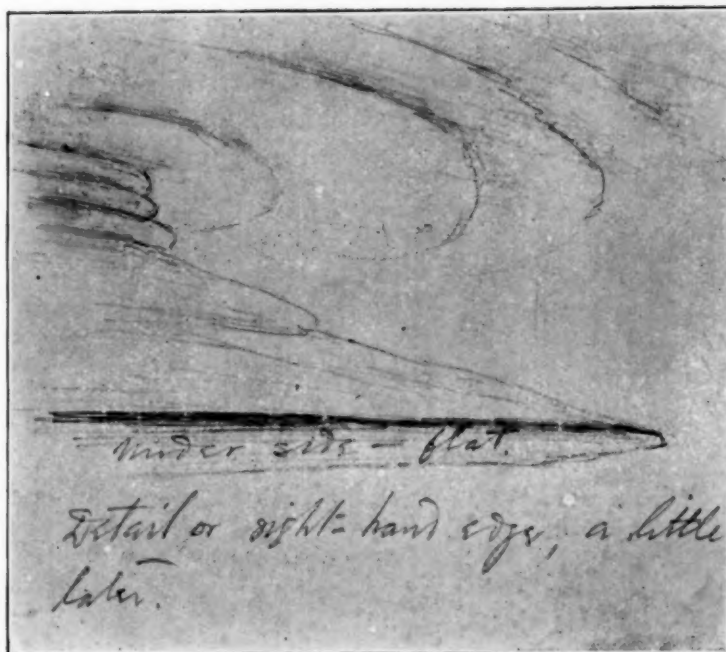
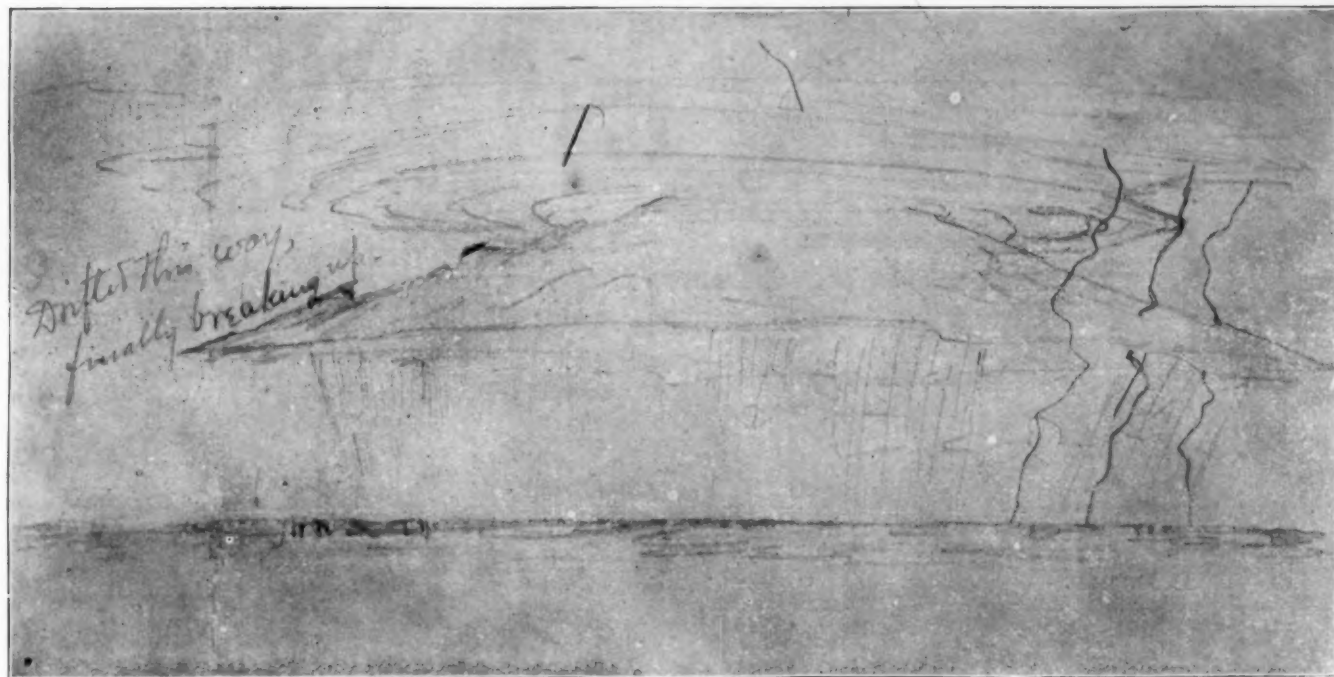
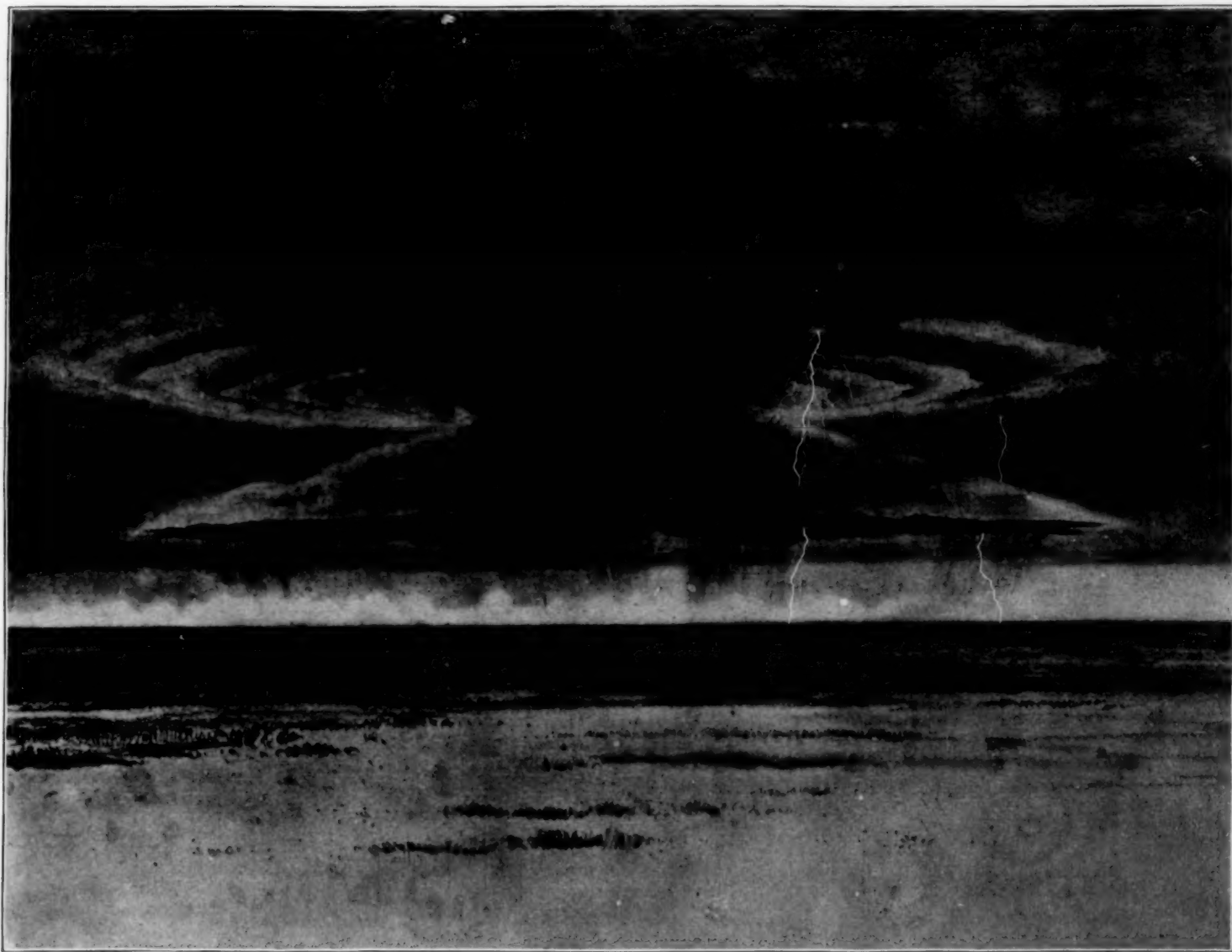


Chart XI. Sketches of Umbrella Cloud.



These sketches were made by Mr. W. D. Johnson on July 25, 1896, at Garden City, Kans., and are reproduced from his field note books without alteration.

Chart XII. Completed Drawing of Umbrella Cloud.



This drawing was made in 1897 by Mr. De Lancey W. Gill from the sketches and descriptions of Mr. Johnson.